

THE  
INSTITUTION  
OF PRODUCTION  
ENGINEERS  
JOURNAL



JANUARY 1959

# THE INSTITUTION OF PRODUCTION ENGINEERS JOURNAL

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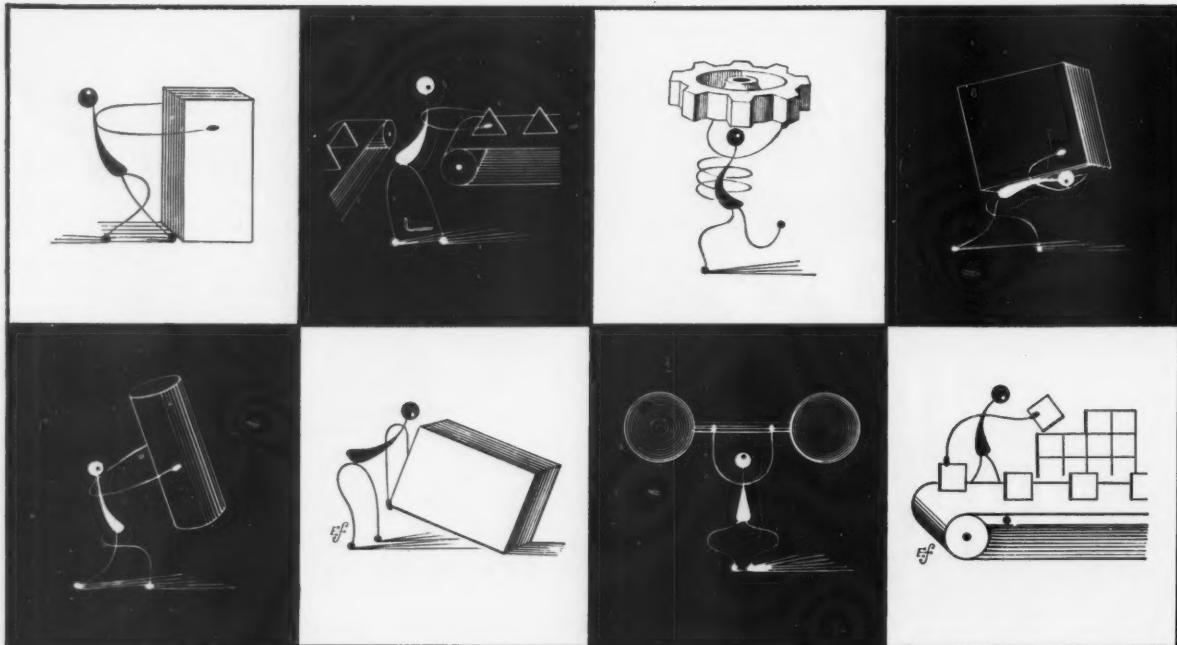
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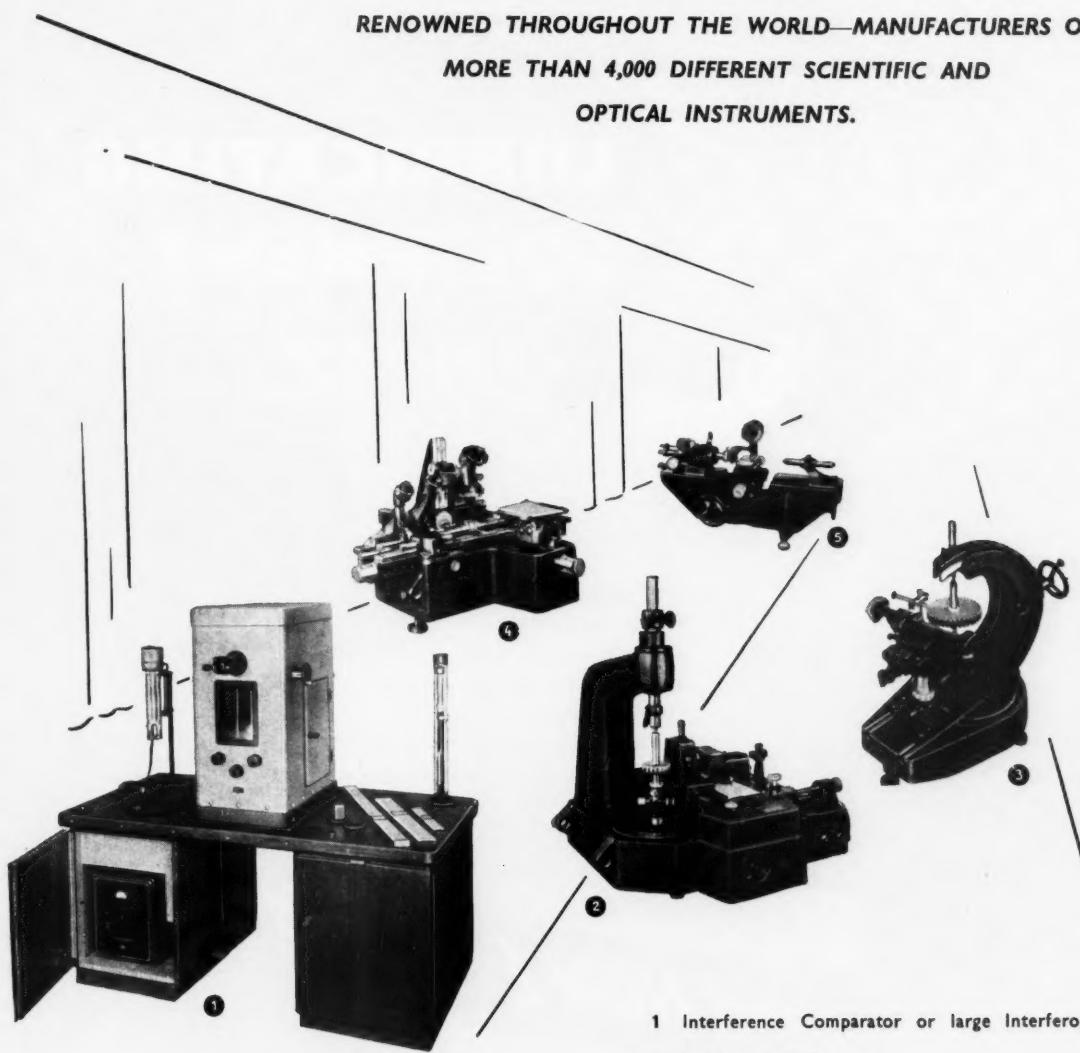
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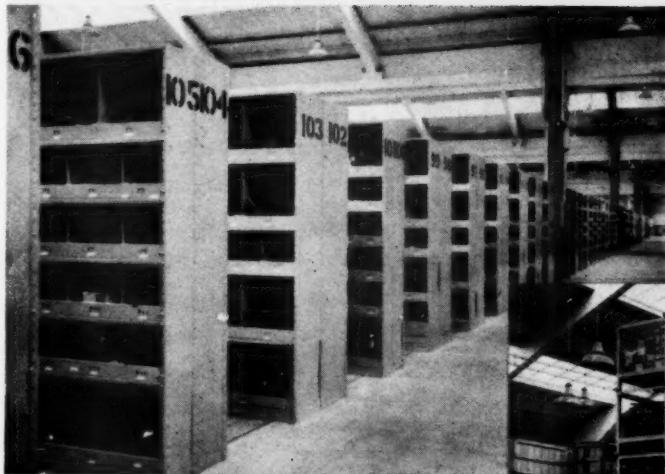
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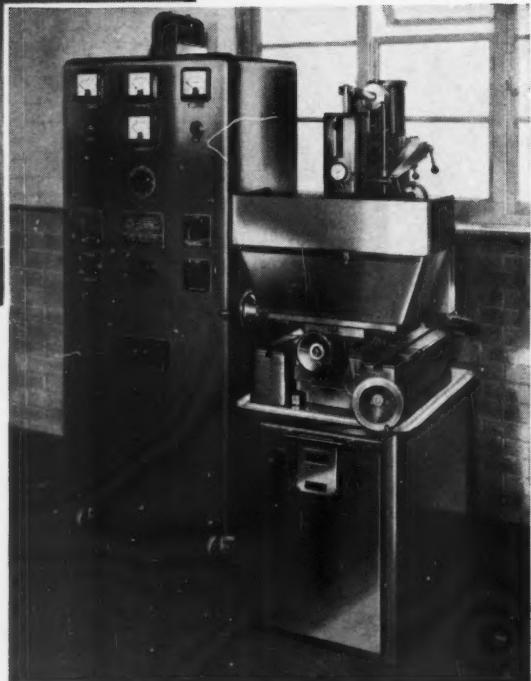
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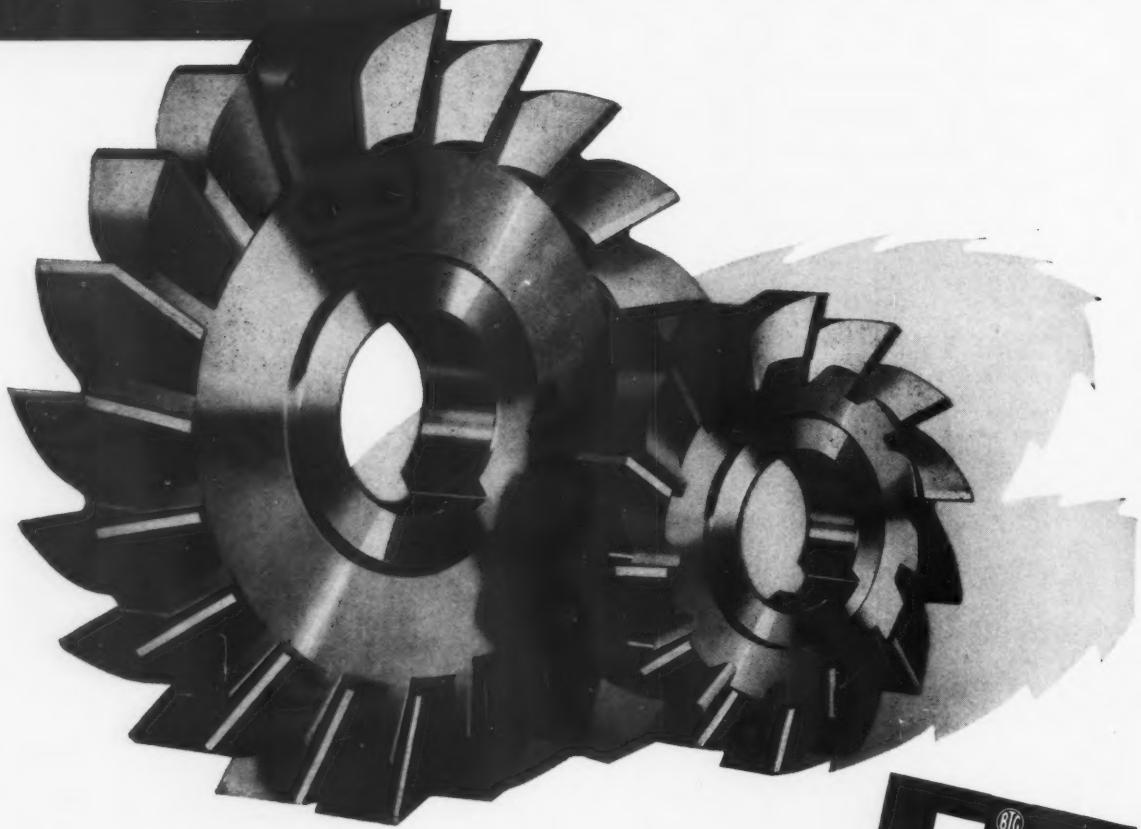


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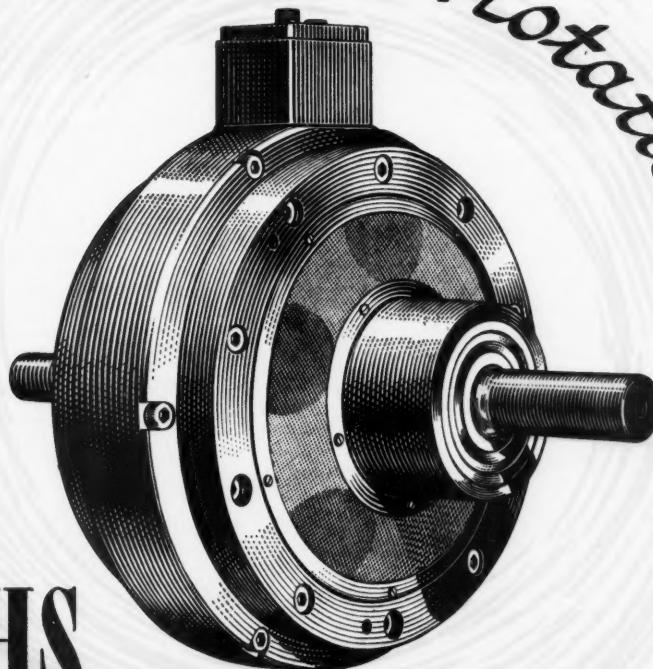
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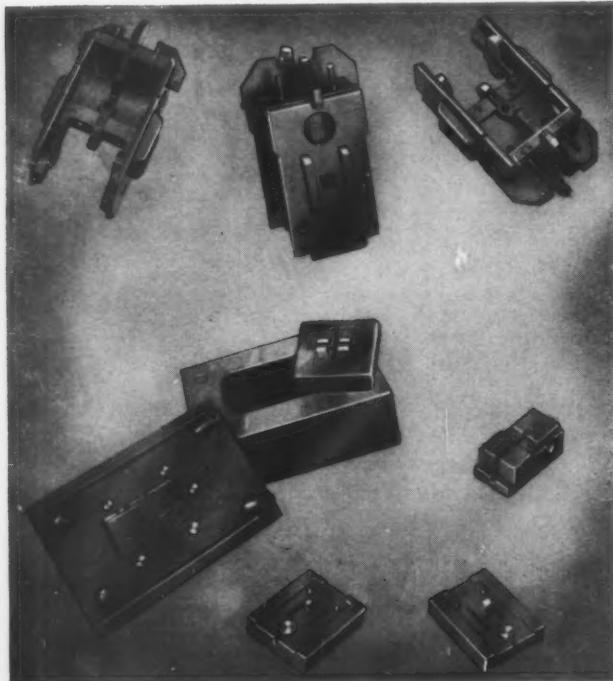
Double Six Master Hob Steel — non-shrinking, through-hardening.

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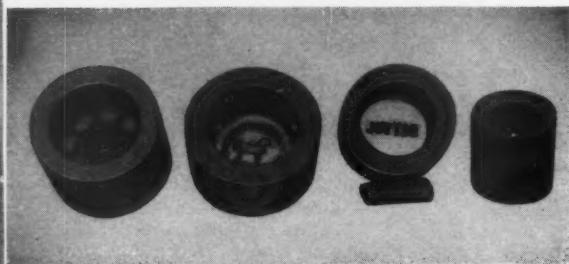
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*Below — Example of moulds and products made by the hobbing process.*



*Left — Moulded electrical contact block and mould.*

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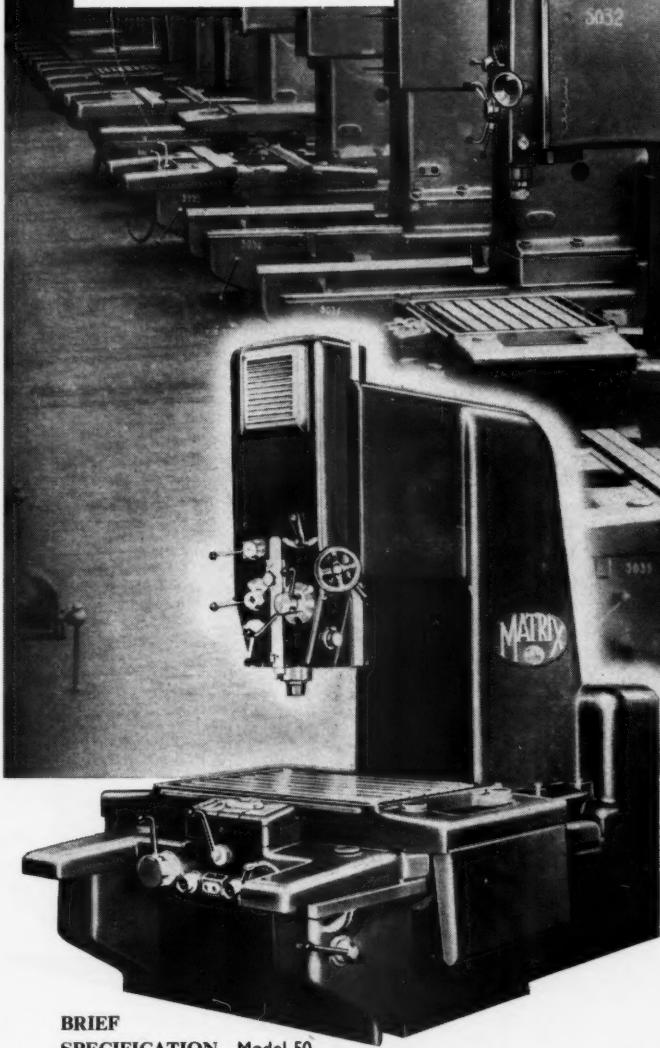
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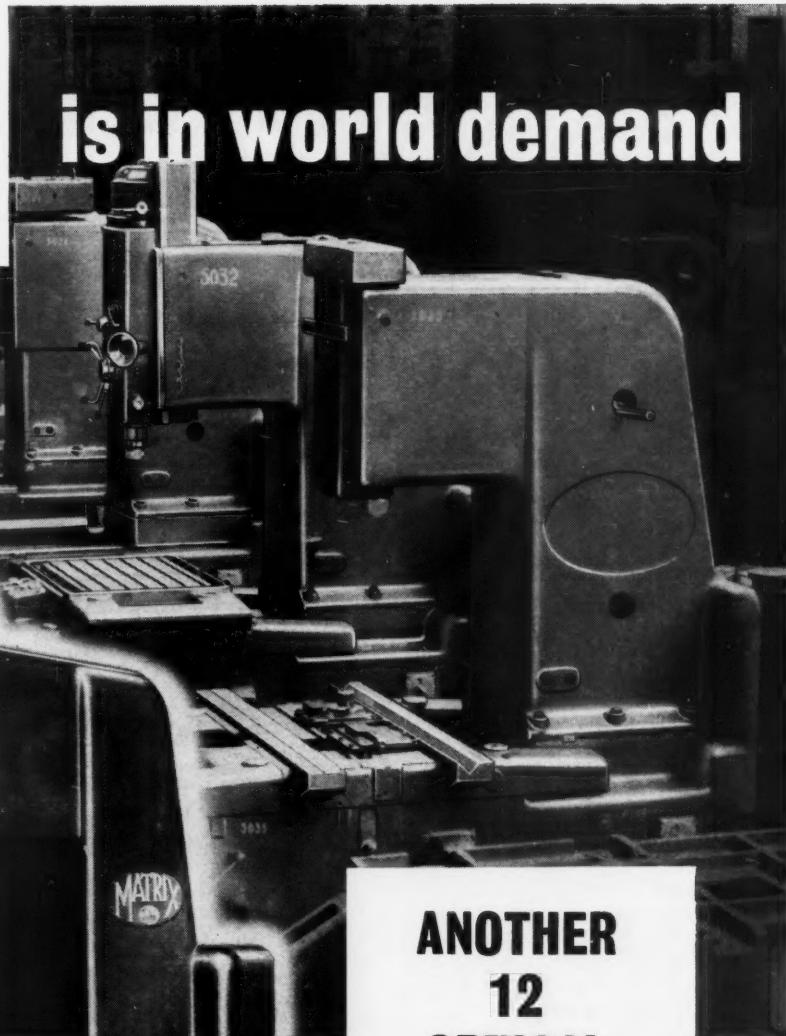


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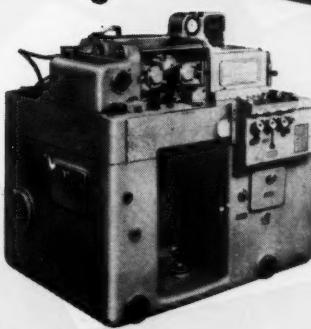
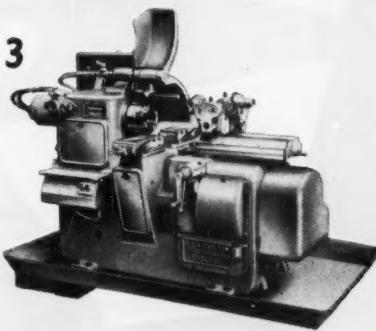
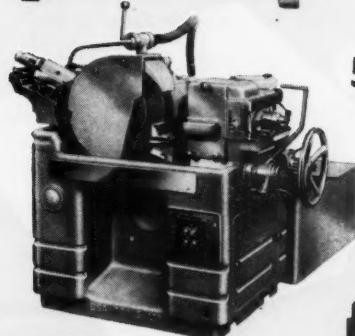
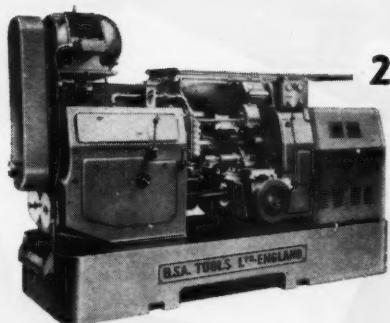
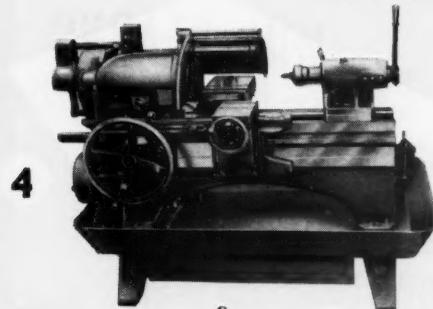
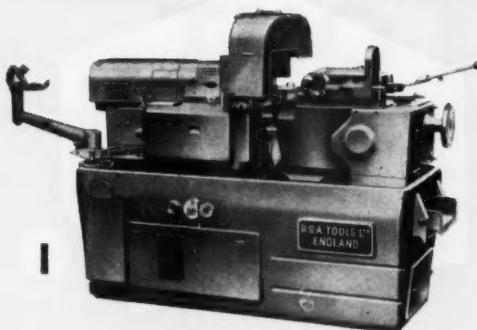


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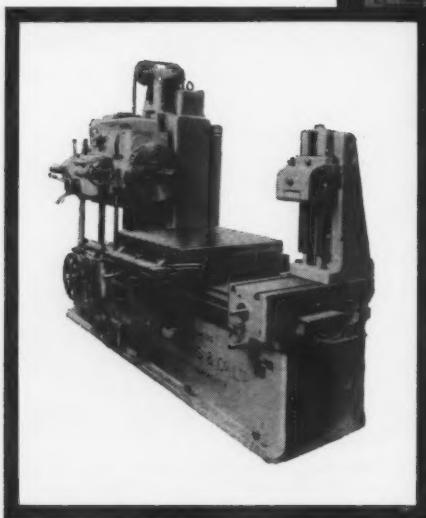


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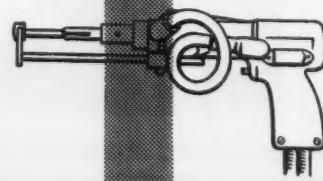
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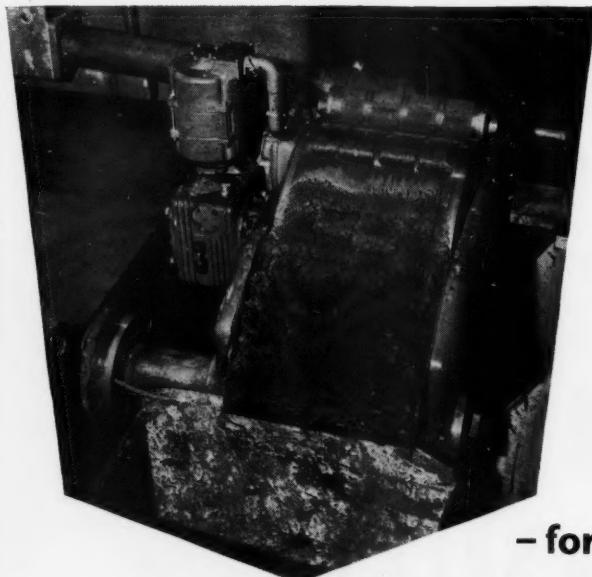
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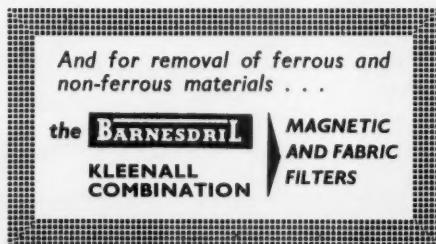
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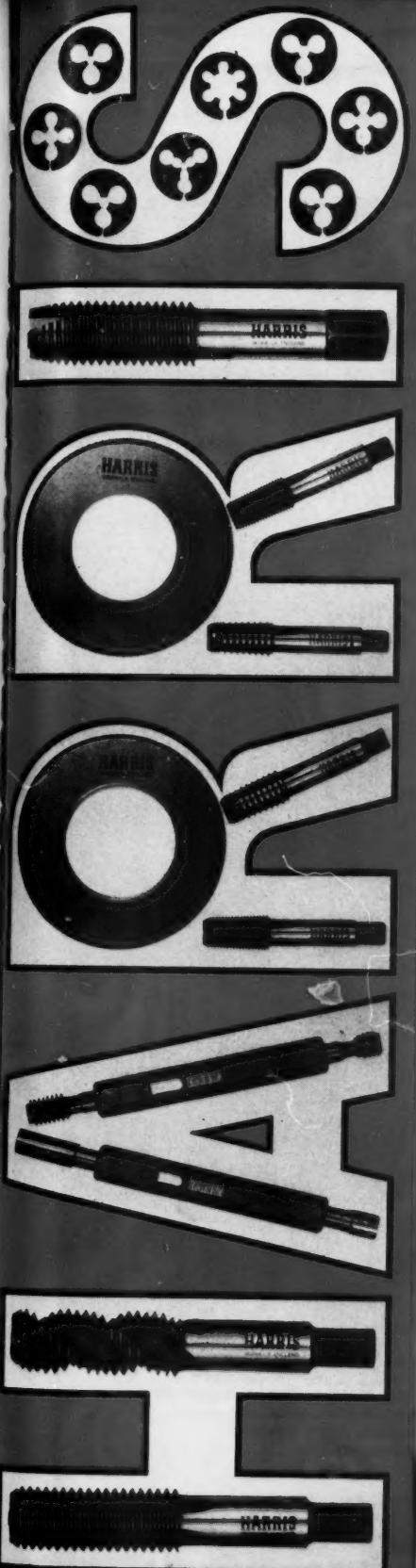
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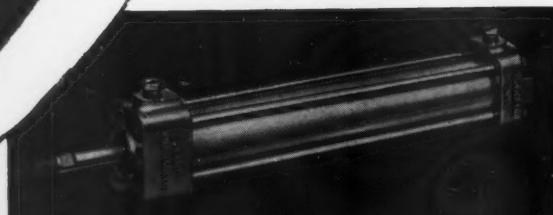
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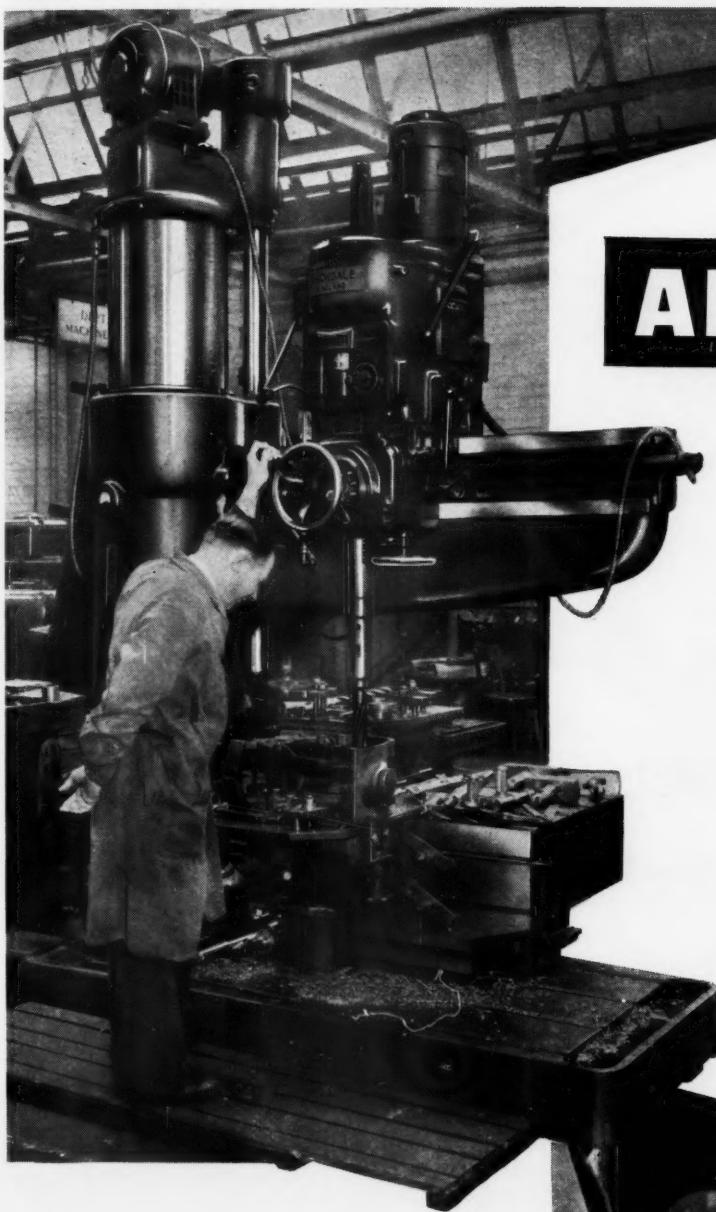
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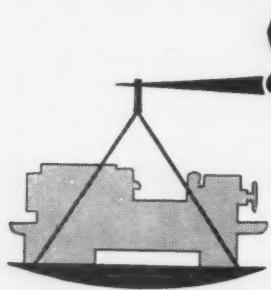
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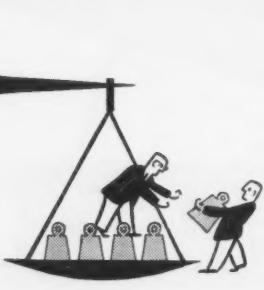
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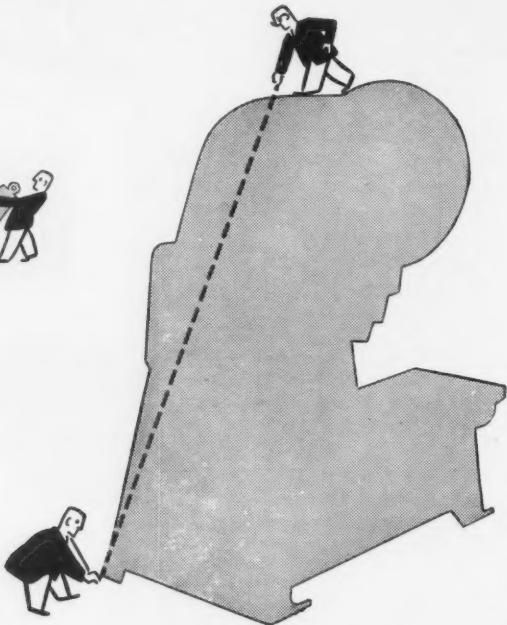
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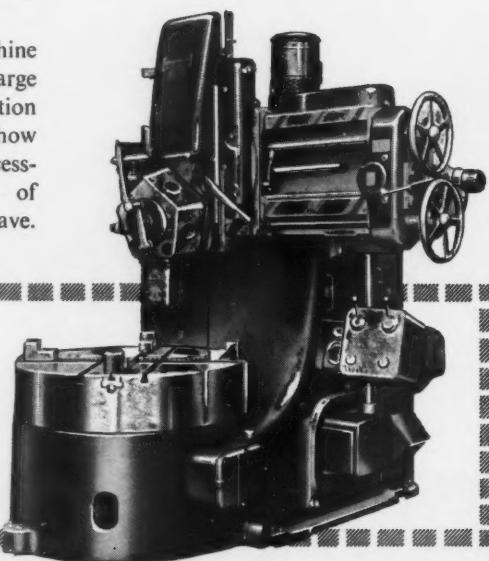
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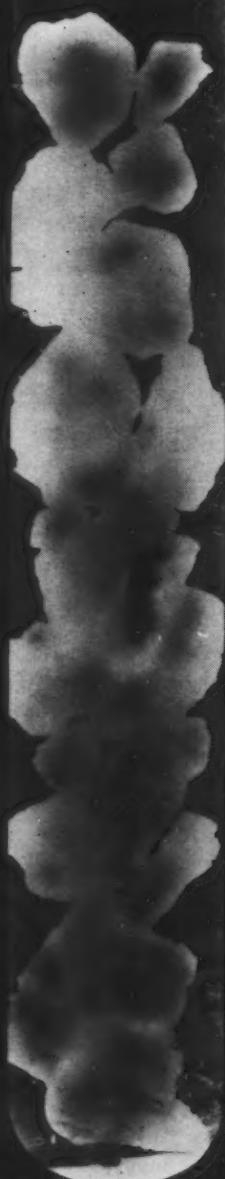
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# of oil after radiation

Here was a problem of national importance. Lubricants were needed by the nuclear industry for reactor equipment, much of it subjected to radiation. Yet, like human beings, oils and greases were vulnerable to radiation. Oils darkened in colour and became coarse-grained solids (solidification being but one of a tangled skein of problems).

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at Shell's Research Centre at Thornton. Series of tests were carried out both in the B.E.P.O. pile at the U.K. Atomic Energy Authority Research Establishment, Harwell, and with Thornton's own Cobalt 60 source of radiation. In 1957, after four years of research, Britain's first range of Atomic Power Lubricants was on the market.

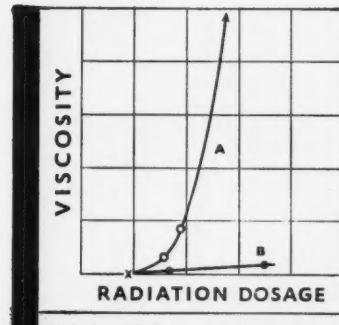
The moral of the A.P.L. story is that Shell research is supremely applicational. The Centre at Thornton is always ready to work with even the most specialised sectors of industry to produce the right oil for the job. If you and your organisation have any major lubrication problems, it will pay you to get in touch with your local distributor of Shell Industrial Lubricants.

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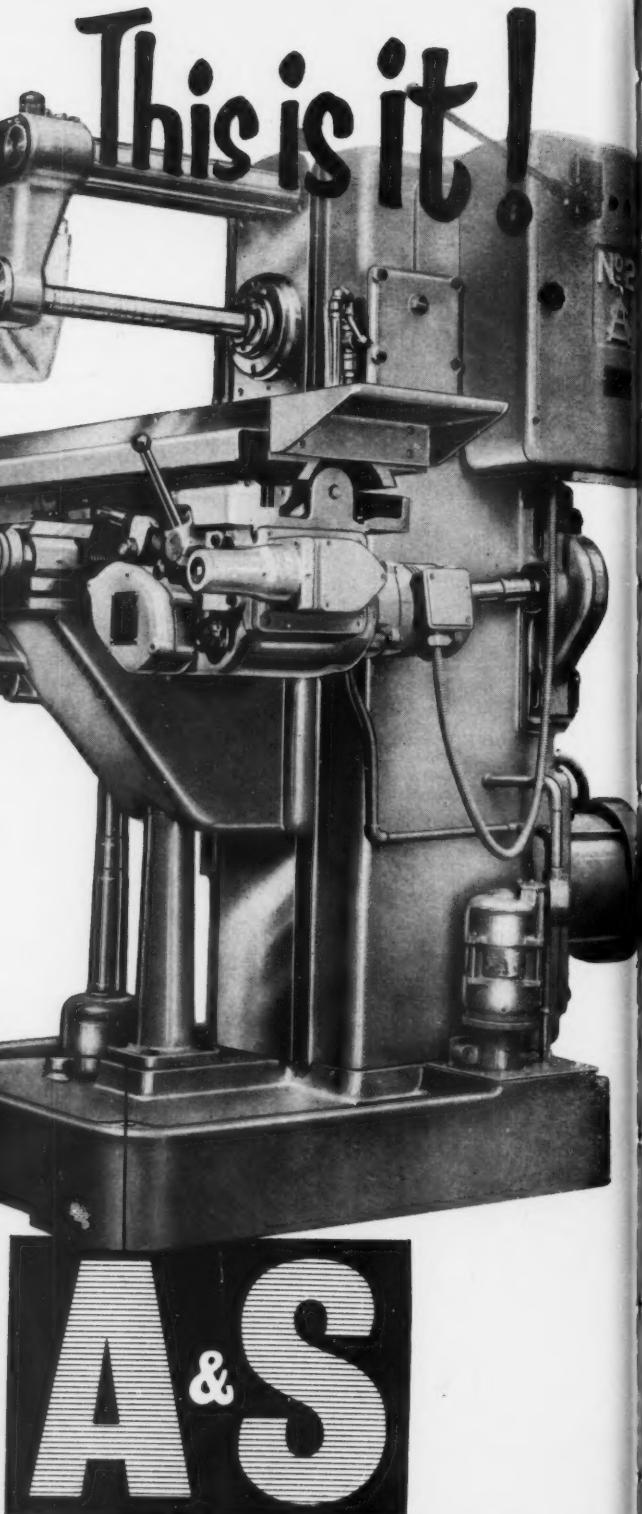
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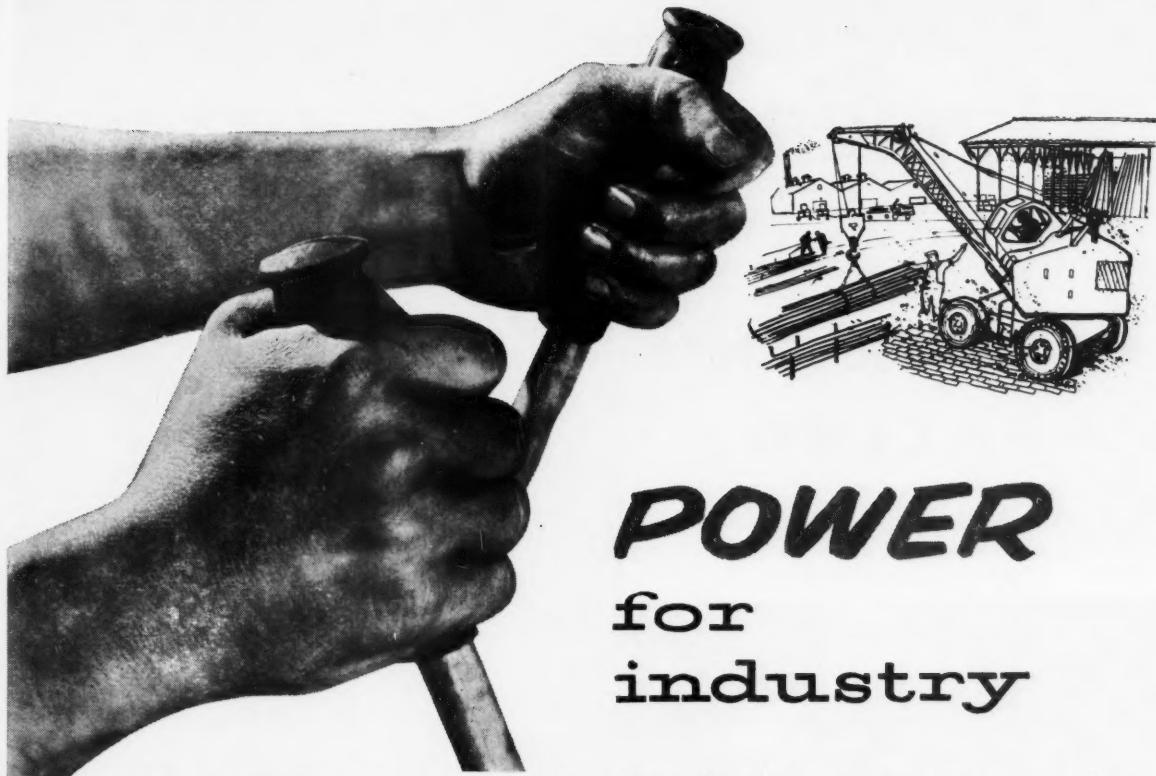
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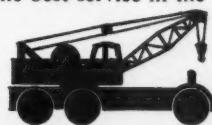
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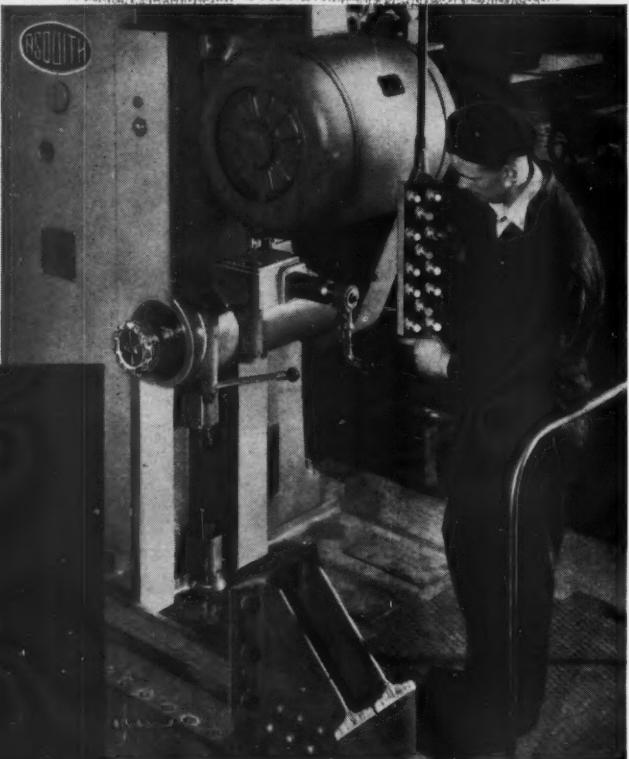
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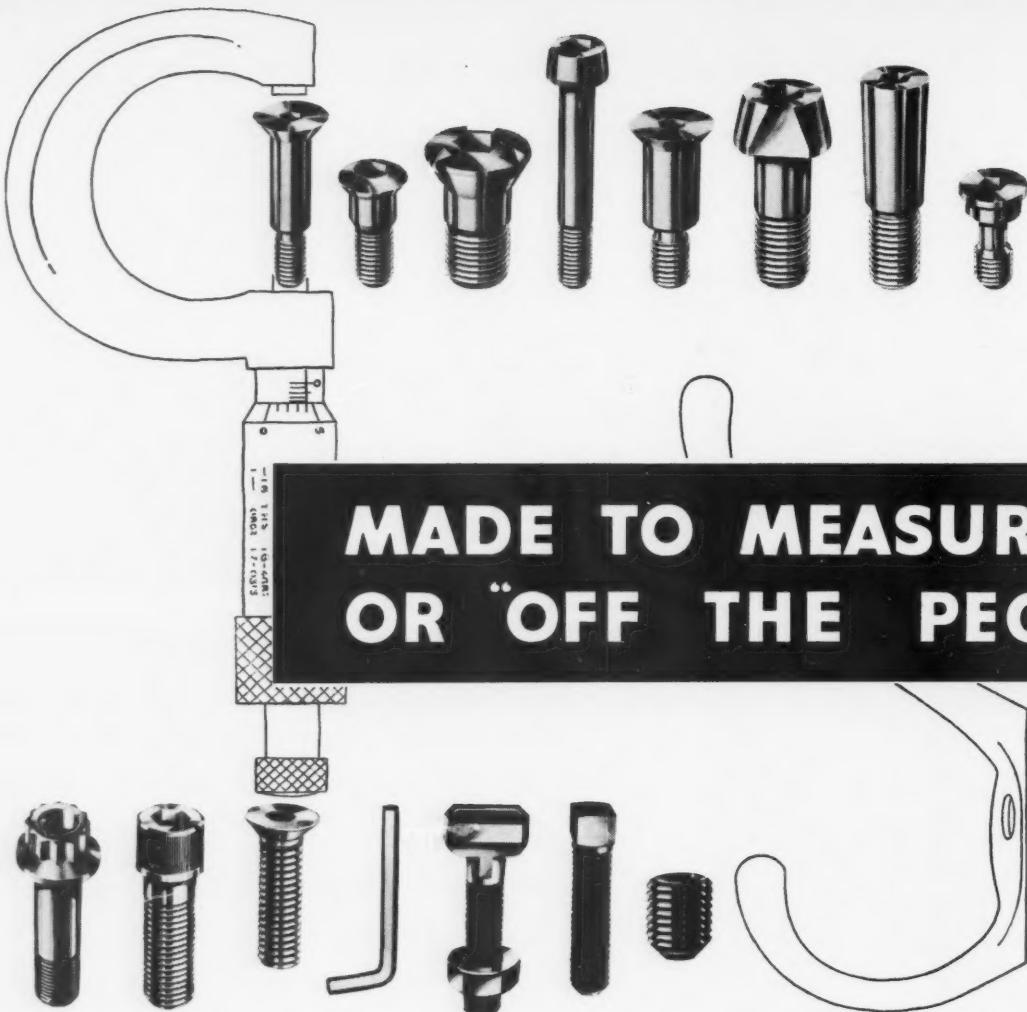
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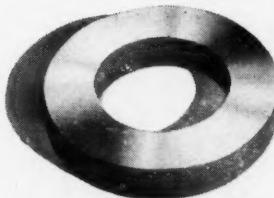
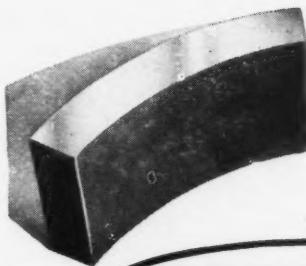
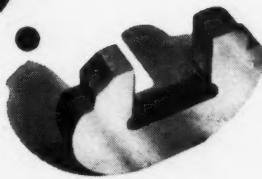
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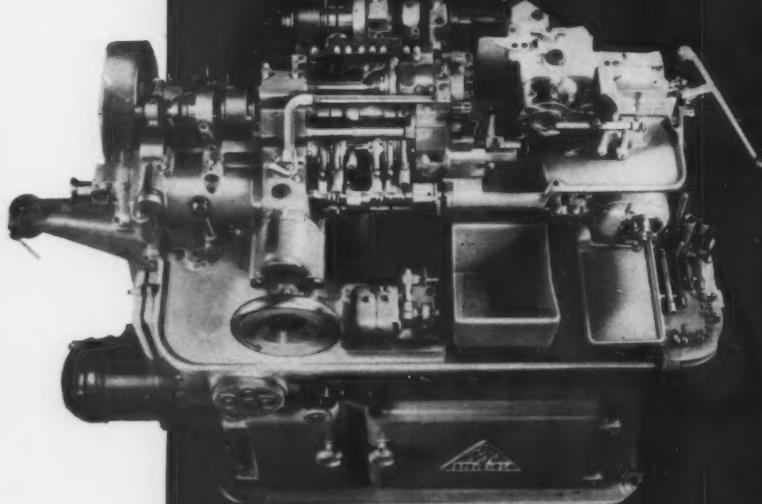




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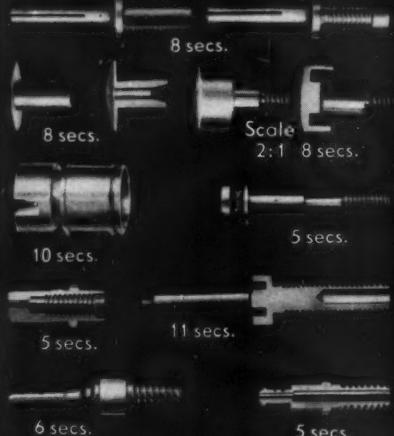
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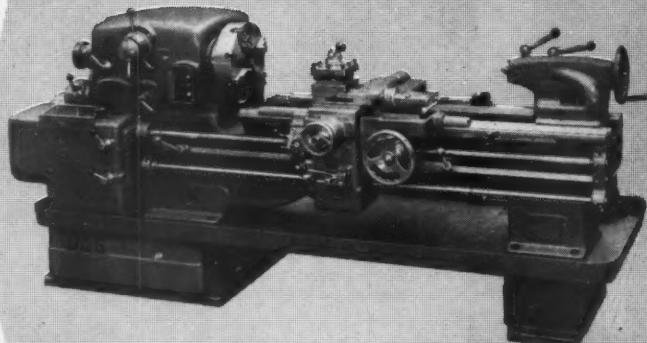
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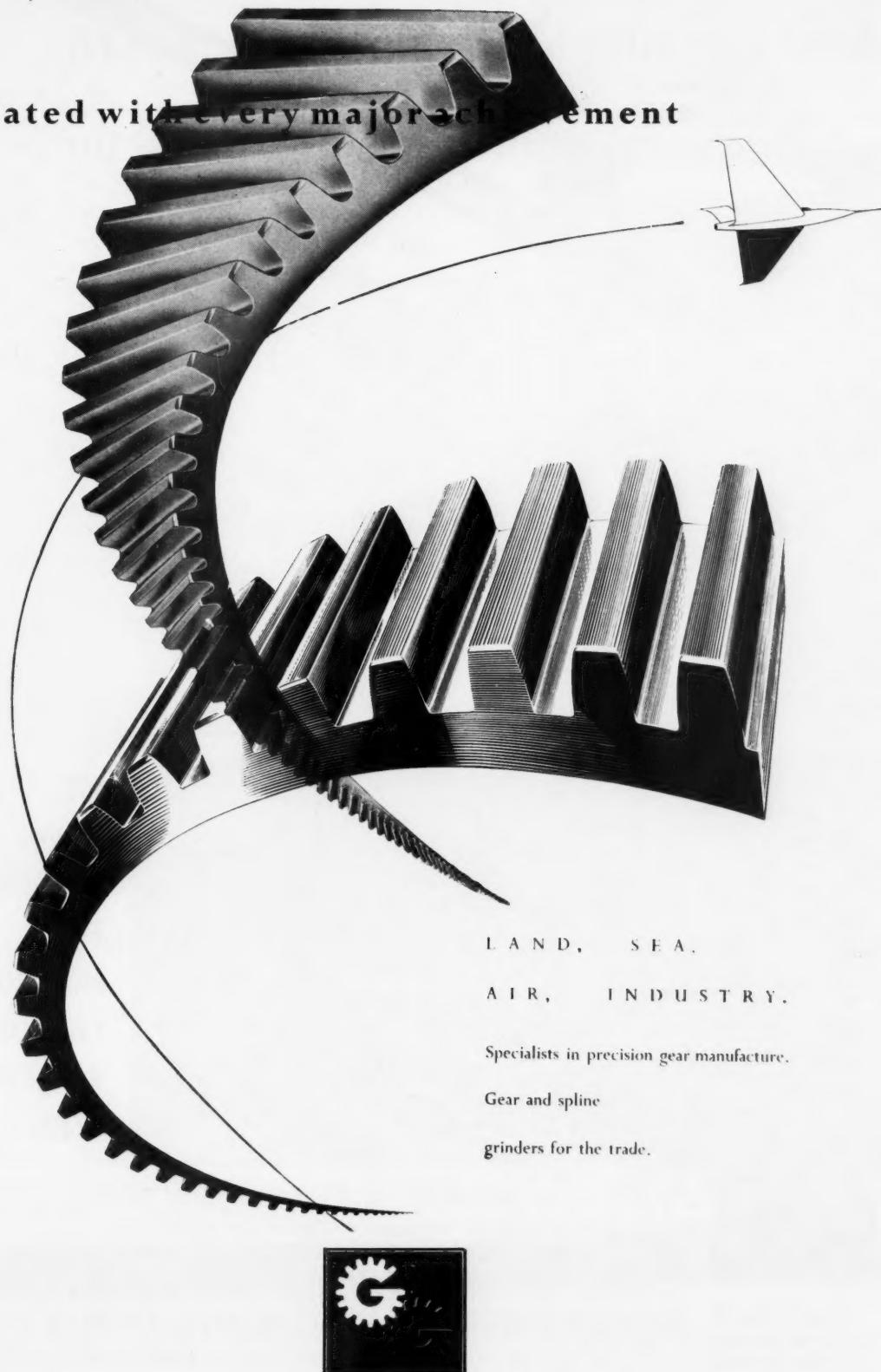


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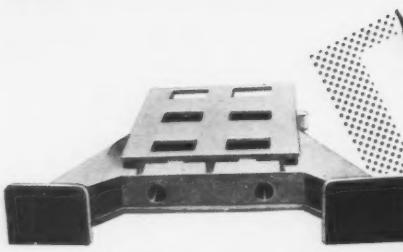


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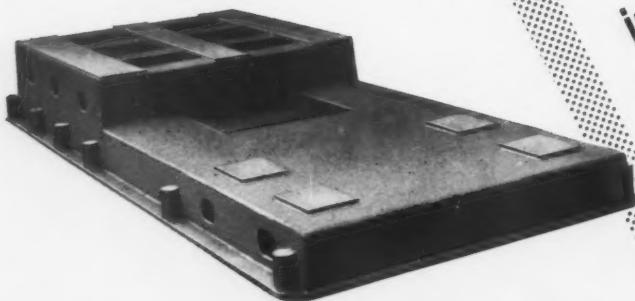
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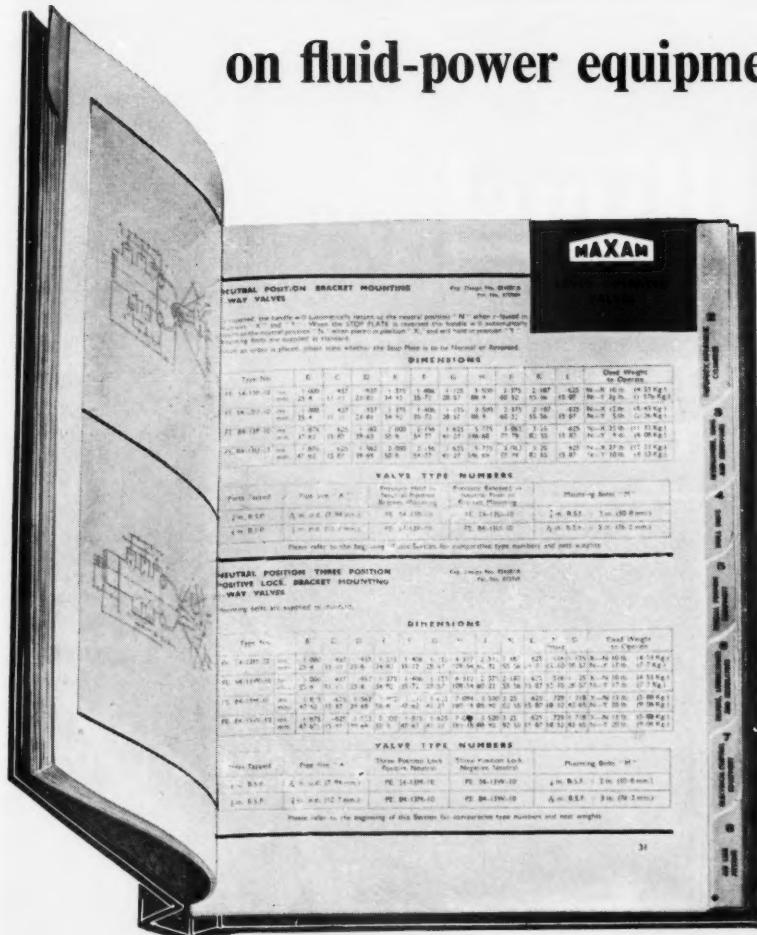
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# Government Policy and World Markets



by E. L. PHILLIPS

*Assistant Secretary, Board of Trade*

*(General Export Policy)*

I PROPOSE to start my talk with a brief review of the general background to Government policy on exports. I hope this will help to set the stage not only for the latter part of my talk, but also for the Conference as a whole.

First, we must consider the importance of exports at the present time. Ever since the War the vital need for maintaining and increasing our exports has been emphasised by whatever Government has been in power. There is a simple reason for this, as you know, but it is one which bears constant repetition. Success in the export field is the condition of our survival as a powerful influence in the world, and of improvement in our standard of living at home.

To take the latter point first, any improvement in our standard of living will be based on an increase in our industrial activity, and an increase in this activity will suck in more imports of raw materials, which will have to be paid for by more exports.

As to our influence in the world, this depends on our maintaining our leadership in the Commonwealth and on our preserving the stability of sterling, on which nearly half of world trade depends. For these purposes we need to contribute our fair share towards overseas development in the Commonwealth, to repay our debts and any withdrawals of money on deposit with us, and then to have money over to strengthen our reserves. All this has to be done out of the surplus we earn each year, and so far that surplus has not been big enough to enable us to build up the reserves at a rate sufficient to enable us to regard the future without anxiety.

We do, of course, earn substantial sums on account of what are called "invisibles" — shipping, overseas

An address given  
to a Conference of the  
North Midlands Region  
of the Institution,  
7th June, 1958.

The theme of  
the Conference was  
"Foreign Competition —  
The Challenge"

dividends, overseas operations of oil companies and the like. But these form only a small proportion of our overseas earnings nowadays compared with what they were before the War, and it is to our export trade that we must look in the first place as the means of increasing the balance in our favour.

Secondly, I should like to look very briefly and broadly, at the success we have had in meeting the challenge of world markets. Our exporters have been confronted since the War by a rapidly changing market and some of the products in which we used to specialise are no longer required in anything like their former quantities. Cotton textiles are, of course, a striking example. The under-developed countries of the world have developed their own textile industries and tend to be more interested in importing textile machinery than cloth and yarn. There is a far greater demand for machinery and, of course, a number of entirely new products are now called for in international trade.

#### **a good response**

In fact, our economy has responded remarkably well to this challenge. In the first place, the total volume of our exports is now twice what it was pre-War and nearly a third of our output is shipped abroad. The share of engineering in our exports has expanded from just over a quarter pre-War to nearly half the increased total. We have strikingly increased our shares of the world trade in electrical machinery and apparatus, passenger cars and tractors. We have made increasingly greater progress with new exports such as diesel engines and locomotives, radar equipment, refined petroleum, plastic materials and antibiotics. Against this the contribution of textiles to our total exports of manufactures has fallen from 31% to 13%, although we still retain our long lead in the woollen and worsted trade. We have also achieved a change in the destination of our export trade as well as its composition. We send, for instance, 16% of our exports to the dollar area now compared with 11% in 1938 and much of the increase has been in shipments to the keenly competitive U.S. market.

In the broad, therefore, it is clear that we have already shown great flexibility in adapting the size, direction and composition of our export trade to the changing needs of the markets.

Nevertheless, there is a less encouraging aspect. Though our exports have continued to rise in recent years, those of our main competitors have increased even more. In 1938, and again in 1951, our share in world exports of manufactures was 22%. In 1957 it had declined to just over 18%. Between 1951 and 1957 the country that had made the most striking gains in exports of manufactures has, of course, been Western Germany. Western Germany has certain advantages that we have not got; in particular she has no armaments burden to support and she has had a constant addition to her labour supply from the Eastern territories. These are substantial advantages. But they do not make up the whole story and it is undoubtedly disquieting that we should have done so badly in comparison with Germany.

Of course, shares in world trade would not be of much interest to us if, even with a declining share, we had been earning the surplus which we need. But, as I have already said, this is not the case. And we must, therefore, watch with some anxiety any signs that we are not completely holding our own in competition with other countries.

#### **Government policy**

##### **general measures**

This then is the background: a vital need to maintain and, if possible, increase our export trade, plenty of evidence that we are capable of adapting our economy to a changing world situation and, at the same time, equally strong evidence that the struggle to do so is a hard one and that we can afford no complacency about our achievement in relation to that of our competitors.

Now I turn to Government policy in this situation, and I shall mention first two general fields of action in which Government policy has been constantly directed to assisting the export trade.

The first of these is the fight against inflation. Inflation is an enemy to the exporter, not only because it raises his prices, but also because it leads to delivery delays which deter customers from placing their orders with us and are generally destructive of our goodwill in the overseas markets. Our information suggests that the Government's measures to halt inflation have already had some success in shortening the length of our delivery delays overseas.

Secondly, the Government have worked consistently to remove the barriers to world trade, not because of theoretical principles but for a sound practical reason. Our trade has historically been spread widely throughout the world, much more widely, for instance, than that of Germany — and it is in our interest to see the general flow of world trade increased so that even if our share of it does not move, at least the size of the total cake grows and our slice is larger. The Government have, therefore, given consistent support to international organisations such as the G.A.T.T. and the O.E.E.C., in their efforts to reduce tariff and quota barriers and other artificial distortions of trade. In addition, of course, the Government seeks in bilateral negotiations with other countries to safeguard the interests of our exporters.

##### **promoting technical progress**

The Government seeks then on the one hand to ensure an economic climate at home favourable to exporters and, on the other, to remove barriers to our trade in the overseas markets. And before I leave these more general aspects of Government policy affecting our power to compete in the world markets, I should perhaps mention the Government's measures to promote technical progress in our economy. These are largely in the educational field (e.g. the new schemes for technical training) but direct support is also given to research in the aircraft, atomic and other industrial fields. The Government is also concerned with education in the field of productivity and to this

end supports the Productivity Councils. But while the Government's function is to encourage and facilitate progress in these fields it is, of course, only those working in and for industry who can ensure that we do not lag behind our competitors in the technical field or in our methods of production.

#### **direct aid to exporters**

So much for generalities. Now you may like me to describe in a little more detail the direct help which Government offers to exports. This is provided chiefly through the services offered by the Export Credit Guarantees Department (commonly known as E.C.G.D.) and the Export Services Branch of the Board of Trade.

E.C.G.D.'s principal function is to provide insurance for U.K. manufacturers and merchants against the main risks of financial loss in their overseas trade. The Department covers both the commercial risk of the creditworthiness of the buyer, and the "economic" or "political" risks — such things as exchange blockages preventing the remittance of payment or import licensing restrictions preventing the completion of the contract. E.C.G.D.'s business has been built up largely through covering exports on cash or short-term credit — up to six months. An increasing part of its business is, however, now concerned with exports sold on longer terms — either "durables" and quasi-capital engineering goods on anything up to three years maximum credit, or the goods required for major development projects which may be sold on anything up to five years credit from time of shipment.

Though E.C.G.D. does not itself provide finance, its cover plays an important part in bringing forward finance. The normal policies are widely accepted by banks as collateral security; and in the capital goods field where financing raises most problems E.C.G.D. will often give a direct guarantee to the financing bank. An extension of this latter facility was announced during the Budget debate by the President of the Board of Trade.

The terms on which E.C.G.D. will cover business are based on a worldwide range of commercial informants who report on the creditworthiness of overseas buyers, and also on economic and political reports received from H.M. representatives overseas. This forms a system of "credit management" whose cost is shared between over 4,000 E.C.G.D. policy holders.

Though E.C.G.D. does not aim to make a profit, there is no element of subsidy in its services: at the moment it has an underwriting reserve of some £13 millions — about 3% of current liabilities. You can see that the margin is very fine. Nevertheless it has been able to reduce the average premium rate for short-term business from 11s. 7d. per £100 in 1950-1951, to less than 9s. now, and their business since the War has multiplied by some 15 times.

Now for the Export Services Branch of the Board of Trade. These are associated with the commercial diplomatic services in foreign countries and the Trade Commissioner services in Commonwealth countries, providing a worldwide network the purpose of which

is to supply information, advice and assistance, usually free, to U.K. exporters. The principal ways in which this is done are :-

1. Market information is available to anyone on demand. A great deal of information can be produced about market prospects, business conditions, trading methods, etc., in most countries. If it is not already available in London, special enquiries are made through our representatives in the countries concerned.
2. Information about changes in tariff and import regulations are promptly reported from all overseas posts, and the Branch is able to give up-to-date information on all these matters and such things as quotas, certificates of origin, merchandise marks, and food and drug regulations.
3. Finding suitable agents or representatives overseas for British exporters. The Branch does not pick names from lists, but obtains from the U.K. principal a detailed brief which enables the overseas officer to do a tailor-made job. Overseas officers do not make recommendations without having personally satisfied themselves about the suitability and willingness of the agents nominated.
4. A large part of the Branch's work consists of passing on information received from overseas to the people who can make the best use of it here. This is done mostly through the Special Register Information Service to which some 5,000 firms and trade associations subscribe. Nearly 10,000 calls for tender from overseas are advertised in this way annually. Economic reports on each country, and short market surveys of the opportunities for selling particular commodities in most overseas countries, are prepared and circulated every year. We have recently started a special series on the organisation of atomic work in many countries, which has been welcomed by firms interested in this field.
5. Other ways in which the Branch helps are by advising business visitors who are going to territories with which they are not familiar, and putting them in touch with the commercial officers stationed there who can often enable them to make useful business contacts; by providing commercial status information about overseas firms; by obtaining samples of overseas goods for the use of British manufacturers; and by directing overseas enquirers to the manufacturers in this country of goods in which they are interested.

In addition to the staff of E.S.B. who are stationed in London, each of the Board of Trade's regional offices and the Ministry of Commerce in Northern

Ireland has a small staff of officers who are concerned with exports. They are always willing to call on firms and can often themselves provide information and assistance of the kind available at E.S.B. headquarters; where this is not possible they can obtain it from E.S.B. or posts overseas.

### the main markets

Now, the title of my talk is "Government Policy and World Markets" and I think I should now say something about the situation in some of the main market areas, as we at the Board of Trade see it.

Here let me begin by emphasising that nowadays all exports which are paid for are well worth having. Dollar exports have perhaps a slight currency advantage over others. But this should not be exaggerated. The main reason why the Government have constantly drawn attention to the dollar markets, and why we have a council of business men specifically devoted to ensuring trade with the dollar countries, is because of the long-term prospects which these markets hold out to us.

Now there is, of course, always the possibility that a temporary recession in the dollar markets, and in particular in the most important of them, the United States, will injure us, but on the whole, although the April figures were not so good, our exporters' recent record in the United States has been most encouraging in spite of the reduction in economic activity there. If we continue to sell in this highly competitive market as successfully as we have done in the past, there should be substantial rewards in the future. Then again there are the countries north and south of the U.S. The subject of Canadian trade is very much in the air at present and, as you know, the Government have devoted considerable effort to encouraging attention to that market. It is significant that the Canadian Trade Mission themselves emphasised that there were great opportunities open to British exporters if only they would show more determination to grasp them; price was right and delivery dates were improved: what was needed above all was active and enthusiastic selling based on careful on-the-spot study of the needs of the market.

### desire to increase trade

In Mexico and Venezuela there is also a desire to increase trade with this country, particularly in capital goods, and these are countries rich enough to provide promising markets for the future. In other countries of Latin America there are, of course, payments difficulties from time to time and the present decline in commodity prices tends to accentuate these difficulties. But many of these countries are also potentially rich and wherever satisfactory payments arrangements can be made, the Government see every advantage in promoting sales of British goods.

Now, coming closer home, there is Europe. Here, of course, the prospect with which we are all most concerned is that of the Free Trade Area. My own belief is that if this can be achieved, it will be one of the great economic developments and turning points

of the century. I think it is probably true to say that the more industry as a whole studies the possibilities that will arise in the Free Trade Area, the more they can see opportunities for expansion in Europe, very often even under present tariff conditions. Here it is particularly encouraging to note the continued increase in our trade with Germany. European activity which has been expanding fast for some years has now levelled off, largely as countries have taken measures, like our own, to counteract inflation. And we have sustained some setback in our trade with Europe generally. But this does not apply to our exports to Germany, where in the first four months of 1958 our exports were 8% above the corresponding 1957 level.

Looking further afield, I should refer to the Advisory Council which, as some of you may know, has been set up to advise the Government on trade with the Middle East and to encourage our exporters to look in that direction. In spite of the Suez set-back, our trade with the Middle East countries as a whole has continued to grow, and many of them have vast riches in the form of oil which must make them fruitful markets in the future. There are, of course, political difficulties but the fact that the Council has been set up indicates the importance which the Government attach to this area.

### the sterling area

Now in all this I have said nothing about the vast range of markets — nearly half our total market — in the sterling area. On the whole, we have done well in these markets in the last year particularly Australia, New Zealand and South Africa and have increased our trade in the sterling area as a whole rather more rapidly than in the preceding years. This is encouraging because there had been a marked tendency for our competitors, particularly Germany, to forge ahead in Commonwealth markets at our expense. But, of course, many of the markets in the sterling area are dependent on world commodity sales and prices for their prosperity, and although they have a substantial cushion in the shape of the sterling balances and of the possibility of obtaining credit for their imports, it is nevertheless likely that the slowing down of activity in the industrial countries will sooner or later affect their buying power. This is something for which we must be prepared and we should perhaps congratulate ourselves that there has been so little sign of it so far.

If one looks at the world market situation as a whole, the striking feature is that world trade has for the present ceased to expand after a continuous and rapid expansion in exports from the manufacturing countries over the last five years. This, of course, is largely due to the U.S. recession and the decline in commodity prices and sales and, therefore, in the purchasing power of other countries — which is associated with it. Even on an optimistic view of the length of the U.S. recession, we are likely to find the going harder in the export markets in the immediate future. We shall need, therefore, to make a better

(concluded on page 16)

# GRAPHITE MACHINING FOR NUCLEAR REACTORS

A Thesis by H. STUBBS, A.M.I.Prod.E.

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THE machining of graphite in quantity was first undertaken at the Atomic Energy Research Establishment at Harwell for the smaller Gleep and Bepo Piles.

In 1948 work was started on the larger Production Piles to be built and operated at Windscale Works, Sellafield, in Cumberland, and it was decided to machine the graphite components on site. The basic principles upon which a machine shop would be laid out, together with the valuable experience already obtained, were made available to the staff of the new works. At this time, too, when machine tools were in short supply and on protracted delivery dates, many of the machines at Harwell, no longer needed there for quantity production, were available for transfer to the new site.

Although detail modifications and improvements have been made since 1948, occasioned by alterations in component design as well as those dictated by experience, the basic principles have remained unaltered.

The two factors exerting the greatest influence on shop layout and production planning are the nature and characteristics of the material itself, and component design. Some enlargement on these two points is, therefore, necessary.

## the raw material

Although graphite is usually looked upon as a lubricant, this fact is not entirely true for some of the forms it may take. Natural graphite occurs in reasonable abundance throughout the world and in the main has good lubricating properties. Considered as a material for reactors, however, this form of

graphite is impure and its refinement to suitable purity involves prohibitive costs. "Synthetic" graphite can be manufactured at acceptable cost from petroleum coke resulting from the distillation of crude oil, and coal tar pitch and, because of recent advances, the quality is of a very high order and the properties are suitable for the requirements of a moderator.

The manufacture of this synthetic material involves the calcination of high quality petroleum coke (to drive off most of the volatiles) which after grinding is dry-mixed with binder pitch, extruded and reheated on a bed of petroleum coke. Following the addition of impregnating pitch the bricks, packed with resistor coke, are again heated to a high temperature over a prolonged period. This form of high purity carbon is very abrasive to cutting tools, particularly as it is very dry and no form of lubricant or coolant is possible during machining as stated later.

The raw material is supplied as "blocks"  $8\frac{3}{4}$  in.  $\times$   $8\frac{3}{4}$  in.  $\times$  32 in. and approximately 140 lb. weight. A fracture section shows a crystalline structure similar to but coarser than cast iron. It is strongest in compression, comparatively weak in both tension and shear.

Reactor material is in two qualities, designated 'A' and 'B'. The distinction is concerned entirely with the nuclear properties of the graphite, 'A' quality being used in the core of the reactor and 'B' quality in the outer or "reflector" area. Before considering the actual machining it is necessary to state the conditions which have to be met to ensure that the finished products, however accurately made as regards their dimensions, will nevertheless still be suitable for use in an atomic reactor.

These conditions may be summarised as :-

1. Freedom from contamination by oil, water and certain non-ferrous materials, notably copper, brass and lead. As far as machining is concerned, therefore, no liquid coolant is permitted; this prohibition is applied also to the grinding of cutters, because of the difficulty of ensuring that the cutters are entirely free from pockets of coolant before going on to the machines. Boxcloth gloves are worn by all persons handling components to prevent contamination from perspiration. No material other than graphite is allowed to be worked in the shop to avoid contamination due to swarf, filings, etc., and tools, particularly hammers, are of steel only, copper, brass and lead hammers being prohibited both in the shop proper and in the cutter grinding shop.
2. Freedom from cracks. This is covered by a rigid inspection at all stages in the machining.

3. All corners to be sharp, clean and free from crumbling. The tool geometry is largely related to this condition and is dealt with under that heading.

### machining

About 60,000 graphite components are required per reactor, many being identical or of similar form. Jigs and fixtures are produced to permit flow line production.

The structure of the material and its weakness in tension combine to make milling the most satisfactory method of machining graphite. Comparatively small cuts per cutting edge permit large amounts of material to be removed while avoiding chipping.

### jigs and fixtures

The following principles, although common to all milling fixtures, require the most careful consideration because of the nature of the material :-

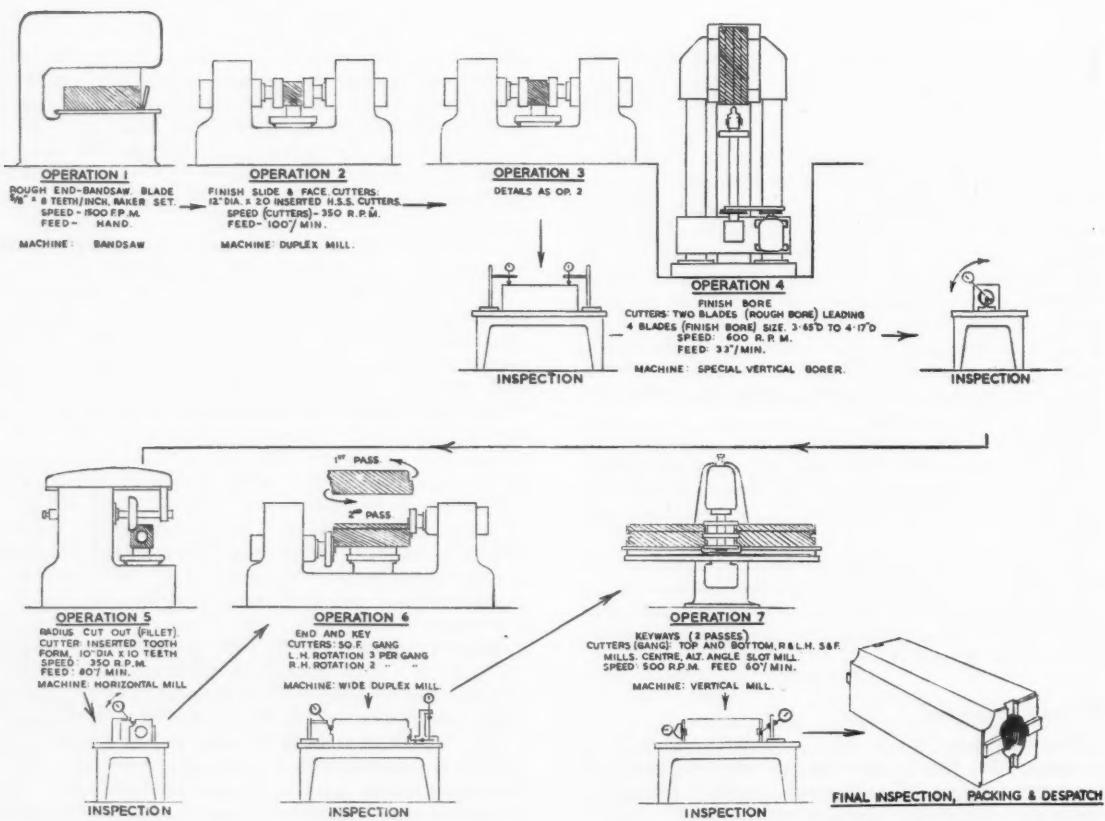


Fig. 1. Operation sequence — core bricks.

1. Rigidity.
2. Design to ensure that the thrust of the cutters is against the stops or solid portion of the fixture, not against the clamps.
3. Adequate chip clearance.
4. Methods of clamping — in particular, broad pads are necessary in contact with the graphite to avoid penetration.
5. Ease and speed of loading and unloading; well-rounded edges to base runners, and padding to vertical edges which may contact the graphite during the loading or unloading process, are very necessary to avoid chipping.

#### line layout

A schematic arrangement of a production line for the machining of "core" bricks is shown in Fig. 1. Apart from the bandsaw and the special boring machine, all operations are carried out on milling machines. Each machine performs one operation only and the bricks are passed along the line on roller conveyors. Boards are placed between the graphite and the rollers to prevent risk of damage by chipping.

The breakdown of the components into sequence operations is a straightforward and comparatively simple matter. This gives the *types* of machines and their order in the line. The actual *number* of machines and consequently the *length* of the line is not known precisely until an assessment of capacity has been arrived at, and this must be done for each machine necessary in the operation sequence layout.

#### production milling — assessment of capacity

To assess with accuracy the production capacity of a given layout, the factors to be taken into account are :-

- (a) the actual or net production time available out of gross shift time (i.e., "clocking on" to "clocking off");
- (b) the actual working (cutting) time during the net production time;
- (c) times, contributory to production, during which actual production is in abeyance, e.g., machine setting time, handling time, etc.

It is possible to assess these factors mathematically and to arrive at an economically convenient solution for any production job by a proper appraisal of them. Thus :-

The *Production Rate* (number of passes milled per 60 minute hour) depends upon the time per piece and the productive efficiency per hour. During any 60 minute hour, allowance must be made for the operator's personal needs, and short duration time losses incidental to operation of the machines. Pro-rated to the hour are allowances which may be made for washing and changing, and meal break. These losses result in a *productive hour* which may vary between 80% and 85% per hour depending on shop

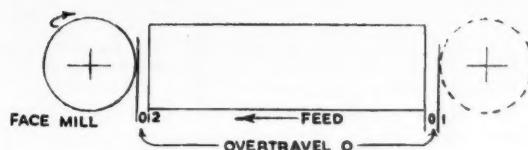


Fig. 2.

conditions. The actual production rate of a machine and the time per piece can be expressed as follows :-

$$P_R = \frac{60E}{tp} \text{ or } tp = \frac{60E}{P_R} \quad (1)$$

Where :  $P_R$  = Production Rate, pieces per hour  
 $E$  = Productive efficiency (80%-85%)  
 $tp$  = Time per piece, minutes

$tp$  is equal to the sum of the pro-rated time per piece of the *cutter change* and *set up time* and the *machine cycle time*  $tc$ . Cutter change and the set up time indicate a direct loss of production.

*Machine Cycle Time*  $tc$  is the time from placing the workpiece in the fixture to the instant it is removed after completing the operation.

*Cutter Change and Set up Time* is the time required to remove worn cutters, replace with re-ground ones and re-align the machine and check that the operation of the machine is at the required rate, finish and accuracy specified. If  $Ts$  is the total cutter change and set up time, and  $N$  is the number of pieces milled in a particular set up, then the pro-rated set up time  $ts$  per piece is :

$$ts = \frac{Ts}{N} \quad (2)$$

For a realistic estimate of productivity, the value of  $ts$  requires to be added to the machine cycle time. Therefore, the time per piece  $tp$  is as follows :

$$tp = tc + \frac{Ts}{N} \quad (3)$$

Substituting this expression for  $tp$  in (1) the production rate formula is :

$$P_R = \frac{60E}{tc + \frac{Ts}{N}}$$

Included in the machine cycle time  $tc$  is the handling time, milling time and idle cycle time; the first and last are, in the case of large pieces such as the moderator bricks, quite appreciable. The milling time is a compound of the actual milling of the workpiece at the selected feed rate plus the "over-travel" (Fig. 2).

Again referring to Fig. 1, the variations in cutter changing time and so on between machines necessitate duplication in some cases in order to maintain a steady flow.

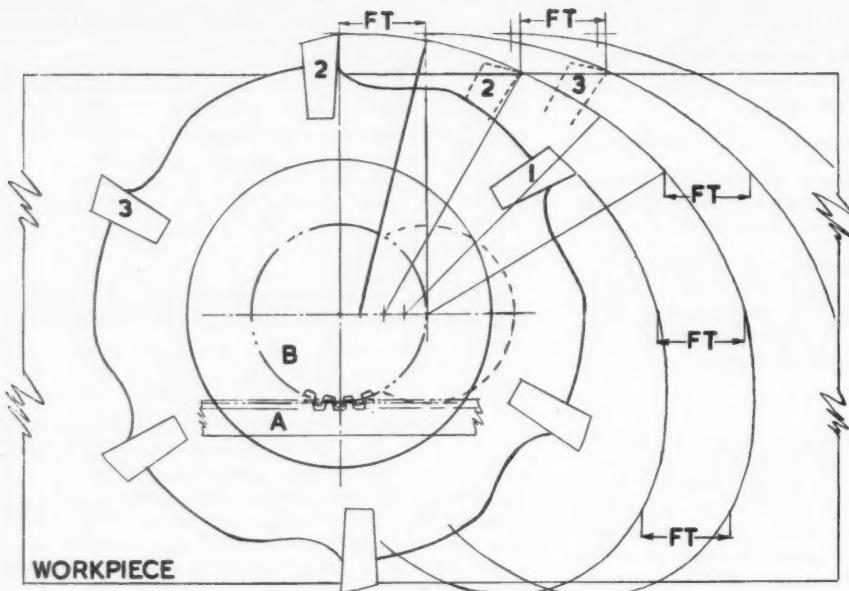


Fig. 3. Conventionalized representation of tooth path generated by side and face milling cutter. The cutter is presumed to be rolled by the action of rack A and pinion B. The feed per tooth or "chip load" is indicated by the constant dimension FT.

The actual line is made up as follows :-

Operation 1	}	1 machine to each operation
Operation 2		
Operation 3		
Operation 4		
Operation 5		
Operation 6	2 machines	2 machines
Operation 7		

*Operation 1* is merely a roughing operation performed on a bandsaw for the purpose of trimming up the rough and out of square ends of the raw material and to present the ending machine (*Operation 6*) with material of nominally equal lengths. The floor-to-floor time per component is least of any operation in the line, enabling in fact a normal shift throughout for the line to be bandsawn in approximately half a shift. The earlier method of dealing with this output was to stack the sawn components in a space left between the saw and the first duplex machine, the operator being removed to other work for the second half of the shift. The extra handling of components on and off the conveyors, however, created delays which were eliminated by keeping the operator on the line for the full shift assisting in handling on the line in addition to bandsawing.

*Operations 2 - 5 inclusive.* The variations in feed rates quoted in Fig. 1 for these operations are balanced by the other factors given in the assessment of capacity, so that the overall time per operation per shift is practically the same. For example, Operations 2 and 3 are faster than Operation 4 when *actually engaged on production*. Cutter changing or machine

down time is longer for each machine on Operations 2 and 3 than for Operation 4. A faster production rate for Operations 2 and 3 is therefore an advantage, when combined with a suitable space in the line near the borer for the accumulation of a small buffer stock to keep this machine operating continuously.

*Operations 6 and 7* are responsible for features made to the closest tolerance in the component and each machine operates with cutter gangs assembled on the machine at each cutter change. Although working on the ends of the component only, i.e., over the 8 in. face, each component requires loading twice into the machine, having been turned end for end before it is completed. Handling time is therefore considerably increased. Cutter changing and re-setting time average 75 minutes per shift, consequently duplication of both machines is necessary to enable continuity of production to be maintained. As a cutter change becomes necessary the operator is switched to the other previously set machine, which has the additional advantage of leaving time for an unhurried setting up to be carried out.

#### cutter geometry speeds and feeds high speed steel

In practice, the deterioration of a milling cutter working on graphite is a fairly abrupt rather than a gradual process during its working period between re-grinds. A side and face cutter, for example, averages 65 passes, each of which possesses substantially the same degree of finish. Only about 5 passes occur, however, between the first signs of breakdown and unacceptable roughness. An explanation for this can

be arrived at by considering the actions of the cutter and relating this to the nature of the graphite being cut.

Fig. 3 is a conventionalised representation of a side and face milling cutter operating on the face of a component. The paths generated by three successive teeth are drawn. The feed per tooth ( $F_t$ ) is indicated by the horizontal distances shown between adjacent paths, this distance being constant throughout the pass. It represents the amount of material presented to each tooth in the plane of travel of the component.  $F_t$  is a combination of the cutter speed (r.p.m.) and the feed rate of the component in a given time.

Thus, if the cutter contains 20 teeth rotating at 350 r.p.m. and the feed rate of the component is 40 in./minute, the feed per tooth will be the amount of advance of the component during 1/20 revolution of the cutter.

$$\text{Time for } 1/20 \text{ revolution} = 1/20 \times 1/350 \text{ min.}$$

$$\therefore \text{Component advance per tooth at 40 in./minute feed} = 1/20 \times 1/350 \times 40 = .005 \text{ in. approximately.}$$

In this case, the abrasive particles produced during cutting impinge on the face of the tooth not nearer than .005 in. from the cutting edge. This abrasive effect erodes or "craters" the face of the tooth, the

crater gradually extending towards the cutting edge until the latter collapses.

Although extremely abrasive, graphite is very free cutting. The pressure of the material on the tooth is insufficient to break off the cutting edge until the metal eventually wears away. A sharp cutting edge is therefore maintained constantly up to actual breakdown.

The indication from the foregoing is that a greater (coarser) feed per tooth would be possible which despite a greater cratering effect would not necessarily unduly weaken the cutting edge. This would offer a reduction in times per component provided that the feed per tooth be increased by increasing the feed rate; and even more important, would increase the cutter life between re-grinds. This has been borne out in practice. The feed rate has been successfully stepped up to 100 in. per minute using 20 teeth cutters running at 350 r.p.m. giving a feed per tooth of .015 in. The depth of cut averages  $\frac{1}{16}$  in. per cutter assembly. The cutter life between re-grinds averages 65 passes compared with 35 passes for the same cutters for 40 in./minute feed at the expense of a slight increase in cutter grinding time, which, however, is not a significant factor. Previously the grinding required amounted to an average of .006 in. per tooth at 40 in./minute feed rate; at 100 in./minute the

letter	refers to	angle or dimension
a	side cutting angle	6°
b	side clearance angle	2°
c	side land	0°
d	secondary clearance angle	12°
e	primary cutting angle	6°
f	peripheral land	$\frac{1}{16}$ " - $\frac{5}{32}$ "
g	corner angle	45°
h	corner clearance angle	17°

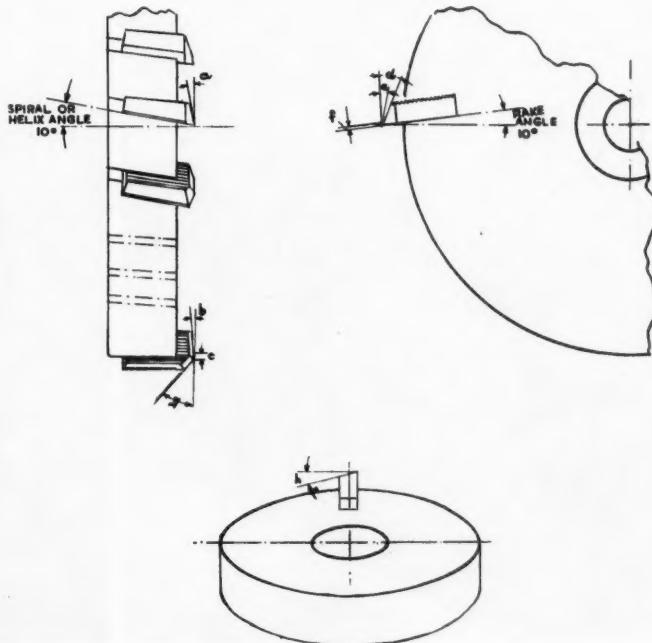


Fig. 4. Typical cutting angles, rakes, etc., used in milling graphite bricks.

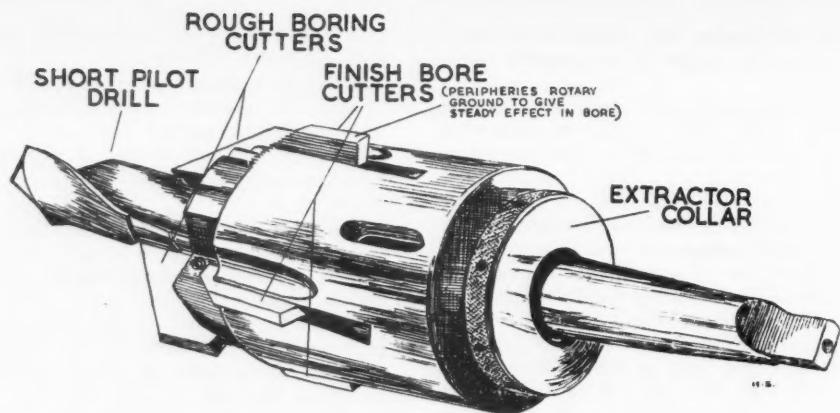
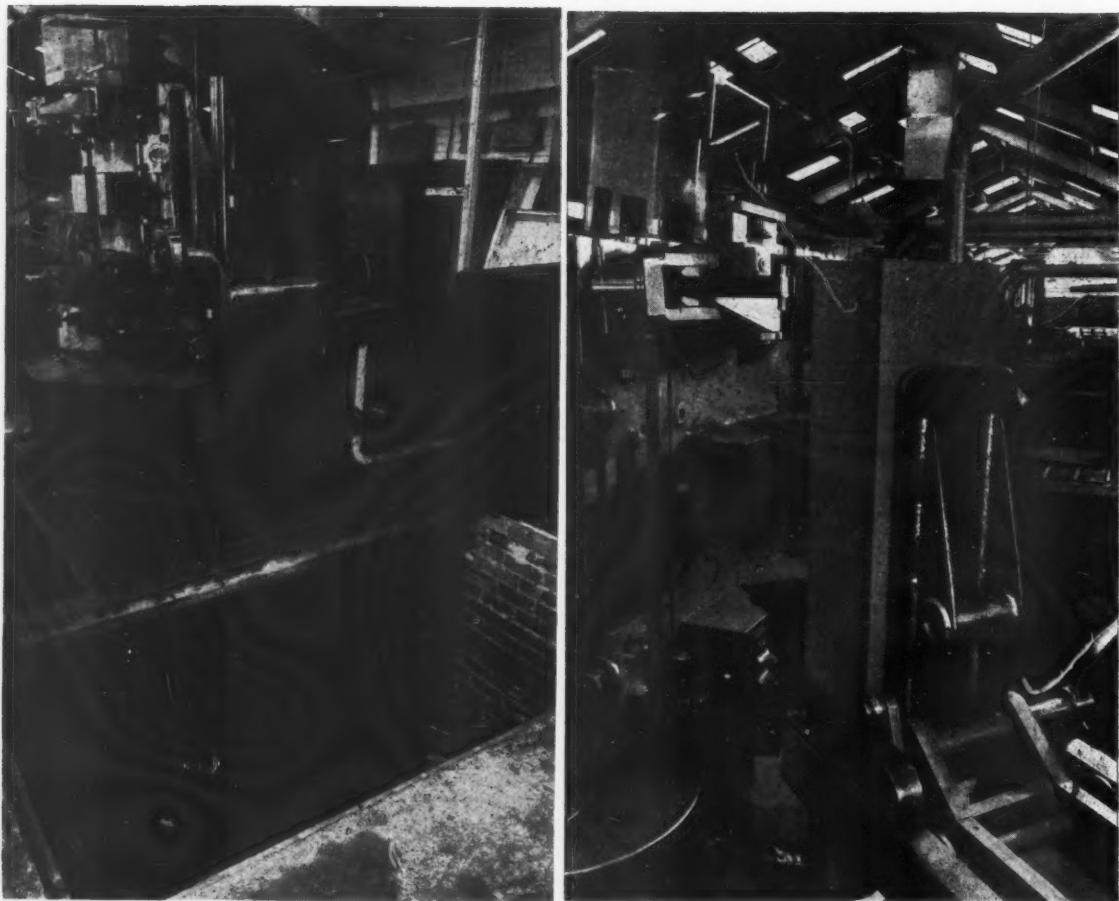


Fig. 5. Combined rough and finish bore cutter (Operation 4).  
The drawing shows the latest development of this cutter. The rough bore cutter referred to in the text did not have the four finish bore blades.



Photograph A. Vertical borer — general view of machine with floor boards removed.

Photograph B. Vertical borer — view showing method of loading component into machine.

average is .015 in., which figures are almost precisely the feeds per tooth in each case.

The feed per tooth can be increased by reducing cutter speed for a given rate of feed. As far as graphite is concerned, however, speed reduction much below 350 r.p.m. for a 12 in. diameter, 20-tooth cutter has a detrimental effect on the corners of the components. These are required to be sharp and clean, but slower running cutters crush rather than cut the material and the result at the edges is a considerable breakaway of coarse particles, resulting in a jagged edge which is a source of further flaking in subsequent handling.

Fig. 4 shows the cutting angles, rakes and clearances applicable to side and face cutters, which have been found to give the best results in practice.

#### **boring graphite**

The charge channels in the earlier Windscale Piles were produced by milling semi-circular features across the bricks, so that when two bricks came together a circular channel was formed. Mainly because of cross-channel leakage at the brick joint faces, the Calder Piles were designed with the channels bored through the lengths of the bricks.

It was decided to use horizontal boring machines for the operations, which comprised an initial rough boring operation through the solid material, followed by a second operation which finished the rough bore to size. For the rough boring operation the cutter shown in Fig. 5 was evolved. This comprised a short drill which served the primary purpose of steadyng the boring cutters against chatter until the rotary ground trailing edges of these cutters entered the bore, and took over this function. Dust extraction was through ports behind the main cutters, thence through the hollow boring bar to a manifold connected to the extraction system. The bore sizes to be cut ranged from a little over  $3\frac{1}{2}$  in. dia. to a little over 4 in. dia. Boring was effective only at a comparatively low rate of feed because of the difficulty of extracting coarse particles of swarf. The boring bar was 3 in. dia., which was as small as it could be conveniently made in view of the need for rigidity on the bore length (30 in.) to prevent axial deviation of the bore, and to be strong enough because of its hollow centre to resist the torque set up by the cutters. The restricted air space between the boring bar and the bore thus prevented effective extraction except at a low feed rate. This in turn produced a high rate of cutter wear in terms of completed components.

#### **axial deviation in boring**

In order to obtain a true start without resorting to a pilot bore or centre drill, the boring bar was led through a steady bush mounted on the machine table and set as close to the component as practicable. By this means the bore at the starting end of the brick was consistently well within the positional tolerance (the tolerance is defined by a cylinder of .005 in. radius, the centre of which is the horizontal axis of the brick).

No such consistency, however, was maintained at the finishing end of the bore. Also considerable heat

was generated by the cutter. It was evident that unexpelled swarf was responsible for the latter and it was considered a reasonable assumption that it was also mainly responsible for the deviation of the bore.

#### **axial deviation — the remedy**

It was apparent that if the components were held in a vertical attitude and bored from below, initial extraction by gravity would materially assist in speeding operations. Messrs. Archdale were approached to co-operate in the development of a vertical borer to meet such conditions. For trial purposes they modified one of their larger multi-spindle drills (see photographs A and B). The multi-head drive was removed. The table face was located vertically, to which was bolted a jig possessing a V-shaped base so that bricks were loaded cornerwise into it. A specially pivoted section of conveyor with stop end plate allowed the bricks to be tilted easily to the vertical position and traversed forward into the jig, the V formation of which accurately located the brick central with the cutter. The boring bar was fixed to the machine base and driven by a separate motor through a bevel gear box and the component was fed downwards to the cutter. This method removed the problems of swarf clearance and axial deviation so effectively that finish bores accurate within the bore tolerance ( $\pm .0025$  in.) were produced at the maximum feed rate of the machine (25 in. per minute) without the need for initial rough boring. The maximum axial deviation was .003 in.

These results have been maintained consistently by the two machines which have since been supplied, built on the principle established in the trial machines. The main difference in the final design is that the feed has been transferred to the boring spindle so that rapid fore and aft adjustment of the table can be made by means of a handwheel, to accommodate the various brick sections. Lateral adjustment is, of course, not normally necessary because of the diagonal loading of the brick.

#### **dust extraction**

Graphite is readily machinable to normal engineering tolerances and offers very little resistance to the multi-toothed cutters of milling machines. The components are comparatively large and require machines of such a size that the power available enables quite deep cuts to be taken with no fear of overloading them. Such deep cutting, however, raises a problem of dust and swarf removal. Apart from the necessity to render working conditions in the shop both pleasant and healthy, it has already been mentioned that the material is very abrasive. Although wipers are effective against larger chips, machine slides suffer severe scoring from finer particles. Covers for slideways are extremely useful as protection but efficient extraction is of the utmost importance. A further point is that dust and swarf uncontaminated with oil or sweepings have a resale value to be offset against shop costs.

The extraction system used is of conventional design comprising main trunkings running the length of each machine line from which branches are taken to each

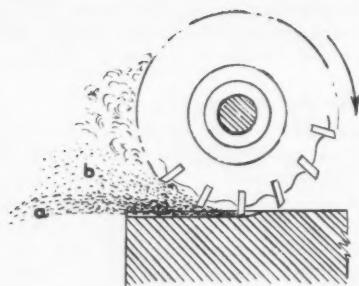


Fig. 6.

machine. This system is exhausted by four interconnected fans. The duty of each fan is 6,500 cu. ft. of air per minute running at 2,090 r.p.m. taking 27 air h.p. Each fan is driven by a 35 h.p. totally enclosed, dust-proof motor built to the special requirements of the U.K.A.E.A.

All branches are reduced at their ends to suit 3 in. diameter flexible tubing which is used to connect them to the machine hoods. The system is carefully balanced to give air velocity of 6,000 ft./min. at all branches by means of swivel type dampers in each branch, with positive stop in fully open position for the above speed.

The fans exhaust to atmosphere via first a cyclone separator (one to each fan) where approximately 90% of the dust, etc., is deposited and collected below the cyclone in paper bags ; and, secondly, through a series of filter bags which retain the very fine dust carried over the cyclone. These filters are

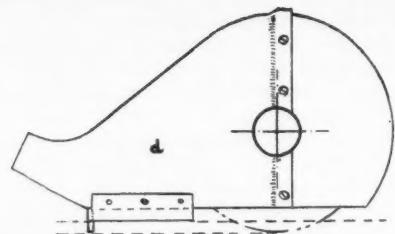


Fig. 7.

mechanically shaken at intervals the dust being deposited into hoppers to which a second series of paper bags are attached.

It is of the utmost importance that the extraction hoods over the cutters are carefully designed for the following reasons :-

- unless they function adequately, the value of the extraction system as a whole is largely nullified;
- large amounts of swarf deposited on machine tables entail time spent in cleaning with consequent loss of production;
- interference of swarf between locating faces of jigs and components causes errors and costly rejects;
- there is risk of damage to machines due to abrasion.

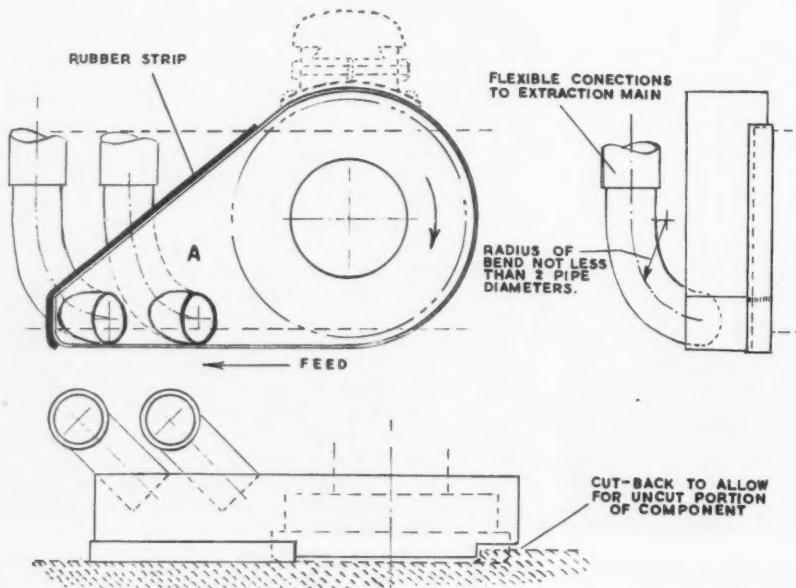


Fig. 1

As far as milling machines are concerned, the extraction problem falls into two categories :-

- (i) feature cutting where no obstructions occur on either side of the cutter, e.g. keyway cutting ;
- (ii) cutting where the component "blankets" a side of the cutter.

Fig. 6 shows a cutter engaged in keyway cutting in which it is seen that the waste is graded from the larger particles having a low trajectory and high kinetic energy (a) through smaller particles of higher trajectory and lower kinetic energy (b) to the dust, the kinetic energy of which is so quickly dissipated that the air movement created by the cutter speed would tend to carry it round were not the opposing air velocity of extraction greater.

The speed at which the cutter revolves is determined primarily by the class of finish required and the extent of cutter wear when related to the feed rate of component, but it is also of great importance to regulate the cutter speed within the limit set by the foregoing, so that it may actually assist the extraction system through the medium of a suitably designed hood. Where this is possible, as in (i) above, the most efficient extraction results.

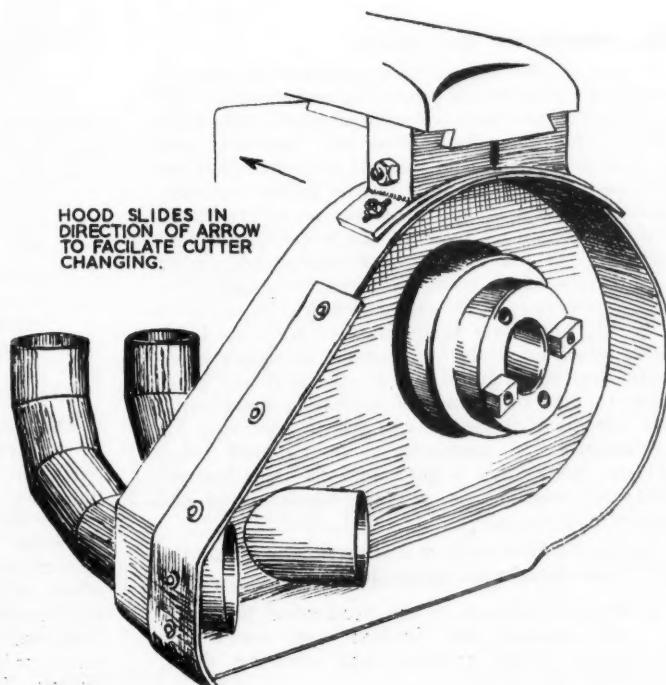
Fig. 7 shows the form of extraction hood which effectively meets the conditions. The extreme bottom

portion, fitting into the feature being cut, is of rubber to give a close fit without the risk of damage due to scraping. The particles are trajectory directly into the air stream or are deflected to it by the shape of the portion (d). The hoods are always made closely fitting to enable the dust to be drawn away in the air stream, the velocity of which is reduced to 10% of the intake velocity at a distance of one diameter from the end.

In the second category mentioned above, it is not possible to do so because of the component itself, the hood and extraction points being necessarily offset to right or left. Fig. 8 shows a hood for a side and face cutting operation which offers a typical example. The extended portion A has two offtake pipes inserted from the back. The extension is as nearly in line with the particle stream as machine clearances will permit. The front of this portion is open, being sealed off by the component itself. The hood is fitted so as to contact the component on its machined surfaces, the edges being faced with rubber to effect a good seal without risk of scraping the finished surface.

All hoods are, of course, effective guards in addition to their primary purpose provided they are made both robust enough and are fitted securely. The most effective method of fastening is by clamping to the machine overarms as shown in Fig. 9.

Fig. 9. Extraction hood in position on duplex milling machine showing method of securing to head cover.



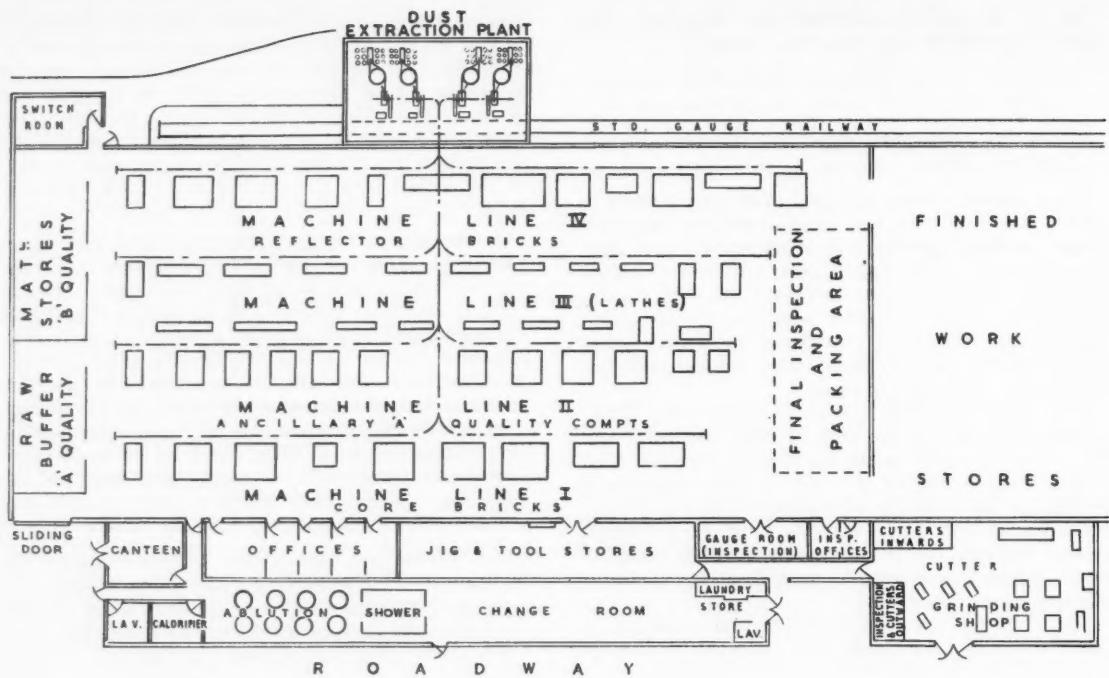


Fig. 10. Plan of shop layout.

### shop organisation and layout

It may at first sight appear paradoxical that the essential newness of this project on an industrial scale should use almost exclusively machines of standardised designs. The reason lies in that very "newness", and the possibilities of radical changes in design occurring with some frequency which involve major modifications in line layout, and a certain versatility in the machines denied to those of more specialised construction. As has already been mentioned, earlier brick designs which could be completed entirely by milling processes were replaced by bricks requiring to be bored throughout their lengths. Similarly, brick shapes which originally were wholly or square cross-section and rectangular in side elevation and plan, began to take on shapes of increasing complexity. This introduced angle fixtures and the necessity for re-orientation of machines, a vertical mill being necessary where now a horizontal mill was located, additional machines to produce newly introduced features and so on.

Taking this into account it is possible to divide the layout into two broad categories, viz:-

1. Service facilities to the production lines, e.g. raw material and finished work stores, tool stores, cutter grinding and servicing shops, extraction plant.

### 2. Production lines, inspection facilities, packing and despatch.

Items in the first category are unlikely to be materially affected by line modifications. The second give rise to two major considerations :-

- (a) passages between lines of sufficient width to allow adequate clearance for the movement of the largest machine in line without interfering with the operation of any other machine ;
- (b) careful spacing of the machines along the lines, so that any type of machine used can be re-connected to the branches of the extraction ducting with little or no modifications involved, and with the minimum length of connecting flexible tubing to avoid air speed losses.

The graphite components of a moderator may vary in size according to their position in the structure, particularly so with the components of the "core", those with the smallest cross-section being in the centre, the section increasing in four stages towards the outer zone, with similar variations in the bore sizes of the central holes. This has a very fortunate effect on the machining process, for by producing large section small bore bricks down to small section, large bores, a very useful reject recovery factor thus exists for both dimensional errors and minor material defects. This has its effect in the line layout, firstly

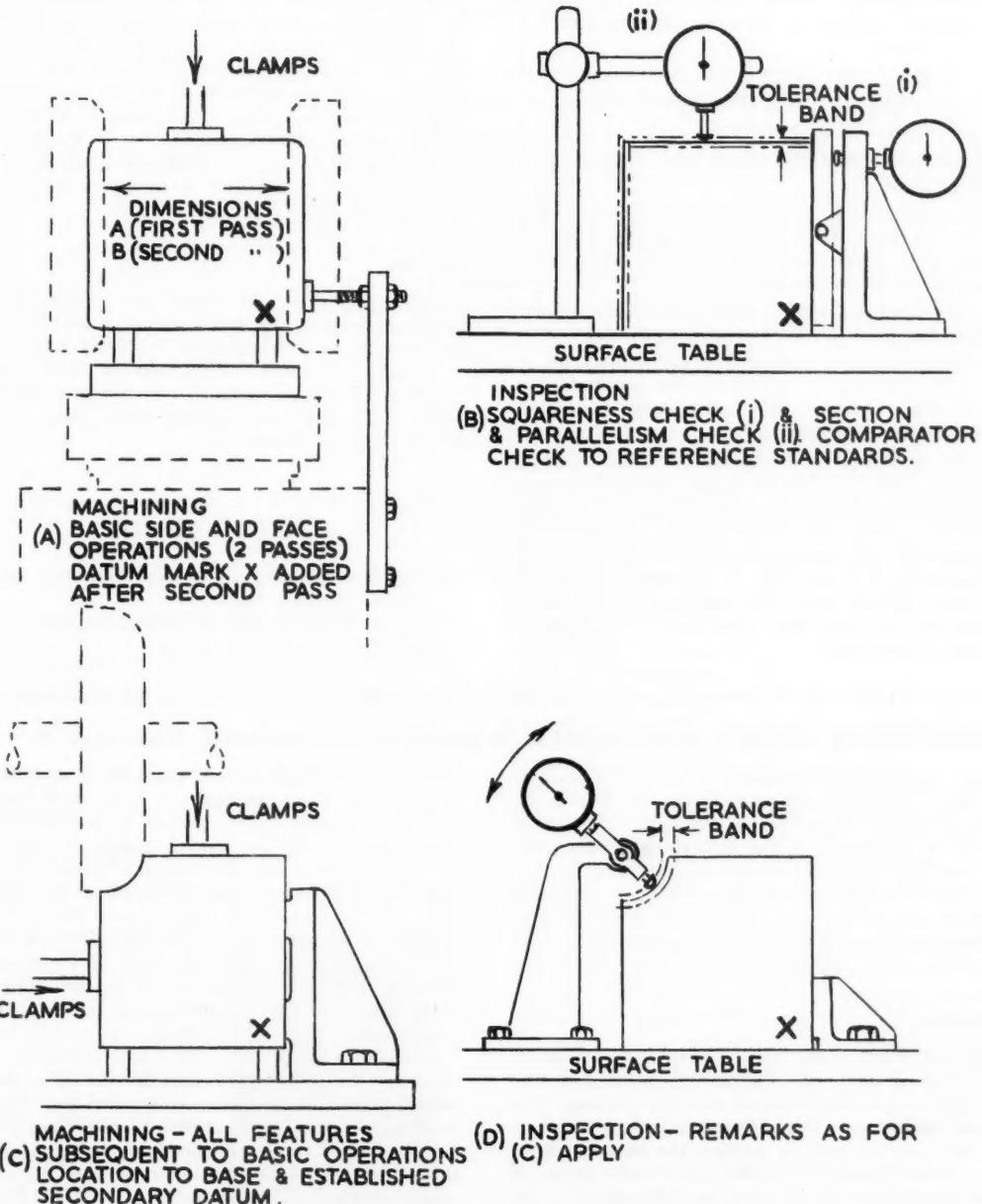
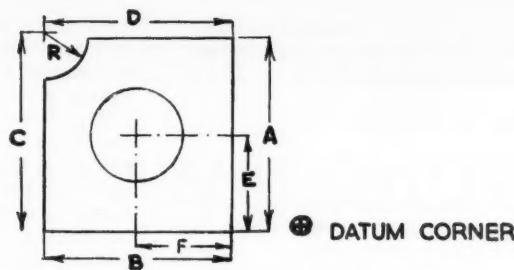


Fig. 11. Establishing the datum.

in making accommodation for the temporary storage of the "reject recoveries" and for their re-introduction into the line when the appropriate type is being made.

Fig. 10 shows a plan of the layout.

#### inspection

There are three main principles on which inspection of components on production lines may be established, viz :-

1. Line Inspection — the inspection of completed machine operations sequence by sequence as they occur.
2. Final Inspection — the inspection of completed components prior to packing and despatch.
3. A combination of 1 and 2.

The factors determining which type of inspection shall be used are :-

- (a) the degree of accuracy required — the smaller the tolerance, the more frequent the need for checking, necessitating the checking point being adjacent to the machine ;
- (b) the weight, relative cost and availability of the raw material even on operations working to relatively broad tolerances, which call for a ready independent check of the work of the toolsetter to avoid costly slips, and make line inspection imperative ;
- (c) the avoidance of further machining after a faulty operation which might render recovery difficult or impossible. For example, a large section component with a surface defect after basic side and face operations would require to be reduced in section, an operation rendered more difficult and time wasting if the component had also been bored. Line inspection is again necessary.

#### "GOVERNMENT POLICY AND WORLD MARKETS" — concluded from page 4

showing against our competitors in the export markets as a whole than we have done in the last few years. But the flexibility shown by our economy in adapting itself to the demands of the export trade since the War, and the recent successes we have had in the most competitive markets, suggests that our exporters should be able to meet the challenge, provided only that they go all out to exploit every opportunity open to them in every market.

#### conclusion

This brings me to the point with which I wish to end my talk. I have said a great deal about Government policy and Government services because that was the subject on which I was asked to speak. I want, however, to end by putting the balance right.

We in the Board of Trade get a wide range of reports about the ways in which we fall behind or are ahead of our competitors in the various markets.

All three systems are operated, but the second is only used for the inspection of small, cheap, turned components not actually used in these moderators and mainly produced from offcut material.

The basis upon which inspection and machine setting are both founded lies in the establishment of a datum on the component at the earliest opportunity. Since the positions of some features are to be determined accurately in two directions, a related or "secondary" datum is also necessary. Unless design features dictate otherwise, the external portions of milled components offer the most convenient surfaces for the purpose. In the present case the selected faces are obtained arbitrarily after the second pass to produce the section (Operation 3, Fig. 1). The operator punches an X on the vertical face of the component nearer to him and about 1 in. from the bottom edge which becomes the datum corner of the brick and determines all subsequent loading and inspection. The relationship of the datum in design, machining and inspection is shown in Fig. 11.

#### packing

After inspection the bricks are packed in cardboard containers, the joints of which are sealed with adhesive tape to exclude dust or other foreign matter.

A label indicating full particulars of the contents together with the inspector's stamp is gummed to the end of the container, which then passes into the Finished Work Stores.

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Where we are behind, it is often clear that the fault is lack of determination to win and keep the customer's goodwill; that is to say to give the customer what *he* wants in the way of design, to visit him in *his* market, to answer his enquiries promptly and to stick to the delivery dates provided. It is quite clear that what is needed to exploit our market opportunities to the full is a purposefully directed effort to sell, requiring co-operation and enthusiasm right through from the salesman to the factory floor. Some firms make this effort, some do not, some make it for some markets and not for others.

The Government can only call attention to the need for the effort to be made and give practical advice and assistance when it is called for. The effort itself must come from industry — and that, if I may say so, is why it is so encouraging to see a group of those engaged in production concerned to spend a whole day — and a Saturday at that — discussing the problems of the export markets.

# SOME IMPRESSIONS OF GERMANY AND SWITZERLAND

by Harold Scholes, M.A., Grad.I.Prod.E.

*In the original Paper for the Schofield Scholarship I discussed the people in, the training for, and the practice of the professions of production engineering and management, based on my experience and reading. The information was biased towards the U.K. and U.S.A. because of the larger amount of writing on those two countries. The Schofield Scholarship gave me the opportunity to follow the same line of research in two countries (Switzerland and Germany) whose experiences and traditions are not so generally known in the United Kingdom—certainly not to me before my visit.*

*This Paper deals briefly with my original Paper and the conclusions I reached and then with the background and detail of the professions of production engineering and management in Switzerland and Germany, together with any conclusions which may be drawn from that.*



Mr. Scholes, who was awarded the 1956 Schofield Scholarship, is a native of Halifax. After service in the Fleet Air Arm, he took the Mechanical Sciences Tripos at Cambridge in 1952.

He then joined Joseph Lucas Ltd., Birmingham, as a Graduate Apprentice, and later joined the General Factory Manager's staff. He was subsequently seconded to the Burnley Factory of Joseph Lucas (Electrical) Ltd., where he spent some time in the Production Engineering Department and as a Quality Foreman.

In 1957, Mr. Scholes worked in Switzerland and Germany as the Institution's Schofield Scholar, and on his return joined Wm. Asquith Ltd., Halifax, where he is now Assistant Chief Production Engineer. He is the current Chairman of the Halifax and Huddersfield Graduate Section of the Institution.



IN spite of the plethora of books and articles on management and, to a lesser degree, on production engineering, especially those dealing with training for these professions, there did not seem to be any written from the point of view of the person being trained. This was one excuse for offering another contribution in my original Paper. Having been trained via University and Graduate Apprenticeship and with some experience in the wide field of production engineering, and hoping to progress to the nebulous ranks of management, it seemed that it would clarify my own thoughts to see what sort of men and training made production engineers and managers and if there was any correlation between the requirements of the two professions.

One must, of course, be careful in defining production engineering and management before branching out into further discussions. For production engineering, I took the definition from the Anglo-American Council of Productivity Report on Industrial Engineering as:

“the application of basic scientific and engineering knowledge and certain analytical techniques to the methods of operating an organisation in industry and other appropriate fields. It requires investigation into the economic advantages of one policy as against another and implementation of the most suitable procedure for raising productive efficiency. To achieve this end, performance and costs need to be checked constantly.”

Not very concise, perhaps, but all-embracing.

For a management definition, I took the definition of management activity from Peter F. Drucker:

"A manager sets objectives, organises, motivates and communicates, establishes measuring yardsticks, develops people."

Now, what kind of people follow the many-sided activities implied in these definitions? Generalising, in the U.K. the production engineer is most likely to have obtained his theory from a technical college background and his practical experience from the toolroom or drawing office. The manager may have climbed his functional ladder before passing on to general management, but also he may have been recruited specifically as "management material" from Universities, public schools, relatives of the owner of the firm, or from other firms.

The sources of men following the two professions of production engineering and management have, no doubt, influenced the type of training provided, but I feel that the courses available (each enclosing a wide variety of subjects) are not of sufficiently high a standard in the U.K. To my knowledge, only one University offers a full-time course in Production Engineering and that as a diploma or post-graduate course; rather more institutions of University standard offer courses in management subjects.

Too much rule-of-thumb has slowed down the progress of production engineering and management in this country, when the often-belittled theoretical mind, if properly trained, can break down barriers to advances in knowledge. It seemed to me that the purpose of training should be to educate the mind and not purely vocational: to develop an analytical approach in considering alternative courses of action.

For production engineers this approach will probably be applied to economic batches, types of machines or tooling, improvements in procedures, etc.; for the manager, in considering the overall plans for the future, in measuring performance against the plans and in correcting where necessary the human feedback system.

This analytical approach of the manager is more essential than ever with the increasing complexity of industry. Together with a scientific attitude to his problems, he needs also a wide view to see the possible implications of his actions and an understanding of human nature in creating a team. A source of such experience is, I suggest, in the field of production engineering, which provides the best training ground for modern management.

### **background to the trip**

#### **(a) Switzerland**

##### *economics*

I chose Switzerland as one country to visit not only because of its reputation as a home of skilled engineers, but also because with little or no natural resources (a quarter of the land is entirely unproductive) it has used those resources to make a formidable and stable country. Some idea of the type of trade the Swiss concentrate on is given in the Switzerland Economic Survey 1956 of the Schweizerische Bankgesellschaft, where Imports and Exports are ranked by value.

Imports.	Exports.
1. Iron & Hardware.	1. Machinery & Mechanical Appliances.
2. Minerals especially Coal.	2. Watches & Clocks.
3. Machinery & Mechanical Appliances.	3. Drugs & Chemists' Sundries.
4. Vehicles.	4. Instruments.
5. Chemicals.	5. Cotton Goods.

Banking and insurance also provide a large source of invisible exports.

The tendency, thus, is to import raw materials and export items having small material content and relatively high labour content, e.g. clocks and watches are 20% of all exports.

Employment in various industries is:—

Engineering and allied trades	200,000
Watches and clocks	55,000
Textiles, clothing and hosiery	100,000
Tourist industry	120,000

##### *engineering*

In the engineering industry in particular there are many small firms: the largest factory (Brown Boveri of Baden) employs 10,000.

In general, judging from the firms I visited, the proportion of research and development work is higher than in comparable British factories: the search for and incorporation of new ideas is a strong selling point for Swiss engineering products. The Swiss regard the world as their market and go anywhere to obtain the business which their own economy cannot sustain.

##### *history*

Perhaps the Swiss feel at home all over the world because of the variety to be found in their own country—varieties of scenery, climate, people, languages and religions. One thinks of the Swiss today as the embodiment of peaceful, if rather serious, virtues but one forgets the past wars, firstly between towns and cantons and later between the Confederation and other countries. Visiting the Swiss National Museums reminds one of the days when the Swiss mercenaries fought for most European countries—a valuable export then.

In contrast to America, where other immigrant nationalities are absorbed and eventually conform to an American pattern, the Swiss maintain their separate ways and live together accepting (and sometimes rejoicing in) the differences. One thing which may blunt the differences between French, German and Italian Switzerland is that the language boundaries are not generally religious boundaries, so where racial influence pulls one way, religious influence pulls another: a personal example of the Swiss acceptance of compromise.

##### *politics*

Politically, the Swiss feels he is, firstly, a citizen of his canton and, secondly, a citizen of Switzerland. This is also influenced by the large amount of power

held by the cantonal governments, inherited from the days when each canton was a state. This tradition is still shown in the responsibility each "commune" accepts to maintain its own poor, even though that citizen has not lived there for years.

Women have no vote in Switzerland and every attempt to give them the right to vote has been soundly defeated. Party politics do not play a large part in Swiss life: this is lessened by the referendums on national issues which can be demanded by any citizen if he obtains 50,000 signatures to a petition.

Naturally enough, the Swiss are very proud of their neutrality. For this reason, Switzerland will not join U.N.O. although Geneva is the home of U.N.O. in Europe and the country is a member of many international bodies attached to U.N.O. Neutrality, however, does not imply lack of prudence. Consequently every Swiss man between 18 and 60 is a member of the army, spending yearly a number of days, decreasing with age, training with his regiment. The professional army is very small consisting only of specialists and instructors: during the War when the army was mobilised one of the permanent colonels was elected General. (There was great celebration at one firm last year when the director was promoted corporal: a progress man was a lieutenant.)

#### *German/French influences*

The ways of life of German and French Switzerland—exemplified by Zurich and Geneva—were noticeably different to me. In Zurich I think of the "Frauen Verein", a women's organisation devoted mainly to temperance and public decency and, according to Zurich men, to preventing Zurich men enjoying themselves. The Frauen Verein, even without political votes, exercise a large influence in German Switzerland at the expense of feminism of the women. In Geneva, with its rather less serious (though just as hard-working) approach to life, I remember the large number of night clubs in a town of 150,000. According to the Genevoise, these are supported mainly by the fugitives from the Frauen Verein in Zurich.

In other forms of culture, the support given to music, the arts, opera and the theatre is notable over all Switzerland. When one also remembers that, with a population of under five million, the country supports 119 daily and over 3,000 periodical newspapers, seven cantonal universities and one federal polytechnic, besides numerous technikums and specialist trade schools, the fundamental soundness and goodness of the Swiss people is apparent.

#### **(b) West Germany**

It is sometimes difficult to remember that Germany as a nation was only unified in 1871 by Bismarck. So much has happened since, that the days of Ruritanian princes, electors and kings are sometimes forgotten but there is still a great attachment to one's "Land".

Other than political boundaries, the Main river forms a cultural and religious dividing line: the Roman influence reached there and somewhat farther north via the Rhine. The Catholics and

conservatives are south of the Main, the mainly Protestant and "teutonic" to the North.

I happened to be working north of the Main, in Hesse, which is roughly halfway across Germany (N-S) and, as I was often told, became part of Prussia in 1866. Hesse is quite a large province and includes all types of industry, farming, Universities and Frankfurt, the New York of West Germany.

Perhaps, in a thousand years, historians may take the American-British zone boundaries as the limits of the influence of the new invaders on Germany. While the symbols of Hessen German youth from 1930-45 were "leder-hosen"—white stockings—and a "stein" of beer, now with the Americans in occupation they are jeans, shirt outside the trousers and Coca-Cola. In other zones the influence of the occupying powers is not so obvious, perhaps unfortunately.

Germany's recovery after the War, and her reputation for good engineering and good management, made this country my second choice. Although West Germany is only part of the original Germany, one thinks of it as a country. I was living only 15 miles from the East Zone and traffic was reasonably free (for Germans) between zones. For most Germans, the driving force to co-operation with the Western countries is, in my opinion, fear of Russia and of becoming like the East Zone with its low standard of living and political slavery.

Germany only really began its post-war recovery in 1948 with the currency reform and in 1949 with the creation of the Bundesrepublik. Most people also give credit to Professor Erhard, Minister of Economics in the government, whose support of a *laissez-faire* capitalism certainly seems to have paid results. Others, more cynical, also give credit to Mr. Marshall and his Plan whose help in re-equipping German industry is often ignored. In spite of imprisonment as war criminals, some of the pre-war aristocracy of industry seem to be back in power: this, to me, seems to be a good example of the German acceptance of divine right of authority in many spheres. I was often surprised at the attitude adopted by supervisors and the meekness of workmen (one colleague said, "There's no future for the little man" accepting that once a "little man" always a little man). Perhaps this is a reflection on the German codification of titles and grades in the engineering world in particular. The trades unions, although having large memberships, seem to concentrate on the welfare aspect of their organisations rather than militant improvement of working conditions and wage.

Many people more experienced have tried to solve the puzzle of the German character; others have written books on the German nation. Although as individuals, I found them charming and not very different from any other nationality, I could not forget the years between 1933 and 1945.

#### **definitions**

In my original Paper I defined the functions of production engineering and management, since the titles themselves are often confused in a country such

as the U.K. where a semi-skilled machine operator is called an engineer. The situation is much clearer in Switzerland and Germany: in both countries the title of "ingenieur" is quite clearly, and in Germany legally, defined. The profession of Betriebsingenieur (production engineer) is well known and respected in Switzerland, where the Federal Polytechnic in Zurich has been teaching production engineering up to degree level for 27 years. In Germany the production engineer is not so well recognised. The "Diplom Ingenieur" (graduate engineer) is highly respected on the Continent whatever particular field of engineering is concerned; the "Techniker" (technician) is almost equally respected and may acquire the title of "ingenieur" after more experience. A skilled man is also proud of his craft and most parents insist on their children following apprenticeships rather than a higher first salary in a semi-skilled job.

The term "manager" is subject to the same differences of interpretation as in the U.K. but basically he "sets objectives, organises, motivates and communicates, establishes measuring yardsticks and develops people".

#### source of men

##### (a) Switzerland

Is the Continental manager and production engineer so different from his British counterpart? In Switzerland I would say "yes"; in Germany: "don't know". In talking about the man it is difficult to separate the kind of man doing a job from the character of the man in choosing that particular line. In Switzerland one finds increasingly that the production engineer is a graduate engineer (Dipl.Ing.) from the Polytechnic in Zurich; the first crop of graduates are just reaching the status of directors and their influence is being felt all over the country in the abandonment of old ideas and methods. The 1930s left a deep mark on the Swiss economy, so business men and, for that matter, workmen are conservative about changing from their present perhaps unimaginative but safe ideas. The teaching at E.T.H. borrows just as much from the German and Swiss experts as from the American. (Many were quite surprised when I had never heard of German writers on production organisation and management, although they had read books by British and American authors.)

The manager can come from any field: there are many small Swiss firms, virtually workmen in their own businesses, but in the larger or more well-known engineering firms, engineers are first choice for many different positions—production, finance, design or sales directors—which confirms the respect the Swiss have for a qualified engineer as possessing just as much a well-rounded education as a classicist is supposed to have in the U.K.

##### (b) Germany

In May, 1957, the German parliament passed a law defining precisely those qualifications necessary for the title "Ingenieur". This distinguishes between the

title "honoris causa" and the academic title. In Germany, the production engineer as such is more likely to have the title "Ingenieur" than to be a graduate engineer, who goes mainly into the design offices and gets the same reaction from the shop about designing unproductive designs as in the U.K.

The Techniker (technician) probably attended a Mittelschule (secondary school), and served an apprenticeship of three years before attending an Ingenieurschule (engineer school) for a further three years. This background is therefore more practical than the graduate engineer (but more theoretical than the corresponding man in the U.K.).

Managers, more and more, are being appointed from those with the title of "Ingenieur" or from graduate engineers. Germany, of course, has for long respected the graduate engineer in industry; as in the U.S.A., to be a high industrial executive is not only eminently respectable but socially desirable, and the apparent power in the hands of industrialists suggested a new (industrial) feudalism in some factories.

#### education and training in Switzerland

##### (a) production engineers

I found the subject of education of production engineers most interesting because of the inevitable comparison with our own meagre facilities. In Switzerland, the educational system is cantonal with the exception of the Federal Polytechnic (E.T.H.) so the preliminary education to attending there varies from canton to canton (and since the students are not all Swiss, from country to country). Basically the necessary qualification is the "Maturität", corresponding to our G.C.E. but at a rather higher level. This is taken at various types of school which tend to specialise in classics, science, mathematics or commerce: the engineer will usually have attended a Gymnasium Type C or "Ober Realschule" (Grammar school specialising in maths and science) from 13 - 19. In addition he must have at least 9 months' workshop practice. The course at E.T.H. lasts for 8 semesters of 4½ and 3 months respectively for winter and summer. Since 1931, when lectures in Production Engineering first began as an adjunct to Mechanical and Electrical Engineering, the content of the course has changed so that the basic engineering subjects form less than half the content, which now includes—psychology, industrial and national economics, production technology, law, chemistry and physics, industrial engineering and mathematics. Specialisation in production engineering subjects begins in the fifth semester; further specialisation follows.

Particularly interesting are the industrial exercises in the seventh semester: students enter a firm for 8 - 10 weeks and follow through a project of their choice from a list of subjects given by E.T.H. and in particular, after consulting the firm concerned, e.g., planning and investigation of movement of work and workers showing production systems and methods and their organisation and economics. These industrial exercises are of a high standard in execution and presentation and must be of some use to the firm

employing the students: instead of nuisances, the students are regarded as valuable temporary additions to the staff and are given real problems to solve.

The final examination is an oral one together with a written "diploma-task" which may, in the case of those students choosing the subject of industrial organisation and factory management, involve a further seven weeks' project in industry.

After qualifying, the graduate engineer goes immediately into a job: no further "graduate apprenticeship" is expected. The graduate, of course, is much more at home in industry within a production engineering organisation than a corresponding graduate, interested in production problems, in the U.K. He need not have his academic knowledge and curiosity dulled by turning hundreds of simple objects under the heading of practical training—that is done before studying and might well be adopted in the U.K. I found far less stress on practical training for graduate production engineers in Switzerland or Germany than in the U.K. All agree that some is essential, whatever field of engineering one follows; possibly as more graduates rise in British industry, we may have a new evaluation of the necessity or otherwise of two years' practical workshop experience after graduation.

#### **(b) managers**

Military service comes during or after studying, so a man graduating from E.T.H. will be approximately 24 when he begins to work. There is little in Switzerland corresponding to the post graduate management training so abundant in the U.K.; self-education is very popular, either by reading or by attending lectures at E.T.H. on special subjects. The industrial engineering institute of E.T.H. has recently begun a course for management lasting a month. Specialists in different firms may form a study group to meet and discuss a special theme, e.g., statistical quality control.

The professional engineering associations S.I.A. (Society of engineers and architects), S.T.V. (Technical association of Switzerland), V.S.B.I. (Swiss association of industrial engineers) seem to do less than their opposites in the U.K. in education, though S.I.A. sets the standard of acceptance of a professional engineer. All organise lectures and publish journals. In German-speaking Switzerland, much German literature on management is read, but American, British and French authorities are also known. After the initial appointment in industry, then education for management depends mainly on learning on the job with much more time devoted to self-education than in my experience in the U.K.

### **education and training in Germany**

#### **(a) production engineers**

In Germany, there is no federal polytechnic as in Switzerland and thus the standard and content of courses varies from one University or High School to another. Similarly, the schools are controlled by the town or "Land", which again introduces variability. However, the system of education is broadly

the same and my particular examples are taken from Hesse.

The graduate engineer, who, like his British counterpart, is most likely to enter the design or development department of a firm, will have attended a "Gymnasium" up to the age of 19, this type of school being biased towards teaching mathematics and science. From there, with his school-leaving certificate, he attends a "Hochschule", usually in his native "Land" (with consequently free tuition) for four to five years, each year having two semesters. In the Technische Hochschule, Darmstadt, mechanical engineers spend some time studying production engineering subjects, but the nearest faculty to "Production Engineering" is that of "Business Engineering", specialising during the last year and a half in Technology. A condition of entry to this course is 12 months' practical work in industry, of which six must be in the workshop and six in the commercial and technical offices. The first five semesters are devoted to basic engineering, mathematics and science lectures and exercises together with some finance, economics, accounting, law and management. The next five semesters are spent studying more economics, finance, commercial and industrial law, organisation and, for those choosing technology, machine tools or other technical courses. This course is thus more like the American business management course than a pure production engineering course. But, looking at the definition of production engineering given above, all these subjects come within the field of production (or industrial) engineering.

Most of the people I met in charge of production engineering departments who had any qualification had the title "Ingenieur". They usually leave school at 15, may do a year in a vocational school, or begin an apprenticeship for three years, during which they attend a technical school during one day and several evenings and, in the larger firms, spend some time in the apprenticeship school. If suitable, they may then attend, for three years full time, an "Ingenieur Schule", graduating with the title of "Ingenieur".

In Germany more than Switzerland, the title "Ingenieur" can be earned in many ways, e.g., a firm may dignify a manager with the title (this disappears if he leaves the firm); attendance at a R.E.F.A. (Work Study Society) school and subsequent practice gives one the title; membership of the V.D.I. (Society of German Engineers) also. R.E.F.A. and V.D.I. perform a large part of post graduate training for engineers: V.D.I. has many subsections (the Association of German production engineers, A.D.B., having been established since 1930) which again have local branches where lectures and seminars are held much as in our own institution. R.E.F.A., concentrating on work study, organises courses at the headquarters in Darmstadt and publishes many books on work study (including the well-known book of standard times) and management subjects. The quarterly R.E.F.A. Nachrichten is published in two volumes, one giving German thought and experiences and the other translations of foreign articles.

### **(b) managers**

From my limited experience in one town, there does not seem to be much "education for management" in Germany. As I outlined above, an "engineer" is really an engineer and is occupied in a technical capacity. Consequently, the managers tend to be recruited from the best men in their particular fields, e.g., the chief accountant will be a graduate accountant, the chief design or development engineer, a graduate engineer; the production manager, an engineer or graduate engineer. The education and training for management is thus by practice in the chosen technique after a more formal academic training than one would find in the U.K.

R.E.F.A., in the "Foreign News", publishes articles on management subjects and also organises courses on works management and industrial psychology, but V.D.I. is mainly a technical society.

## **practising the professions**

### **(a) Switzerland**

After four months in Switzerland, I considered what main impressions were made by the production engineers I had met.

As far as new techniques and methods are concerned, I found nothing which the more progressive firms in the U.K. cannot better. The Swiss, however, in all sizes of factories, seem to have the happy thought of not only studying the principles of production engineering and management, but of applying them. In this they are aided and encouraged by enlightened managers. Of course not all firms are modern in their ideas; the Swiss is just as conservative as the Englishman. Perhaps the firms I worked in were exceptional in that they were willing to have a foreigner in their factory, but in the firms I visited, of all sizes and varying products, I found the belief in and practice of these principles to be very widespread.

In all firms, the executives are keen to keep up to date with latest developments. Because of the teaching of languages in all the schools, they are often able to read articles in the original language. I found conscientiousness a common attribute of all Swiss, production operatives, office workers and executives. (The manager beginning at 7.30 a.m. along with the other staff was quite a surprise to me at first.)

The size of a firm obviously has an effect on the field in which the production engineer or manager practises. One firm with a qualified production engineer for every workshop in the place and several specialist engineers for a particular function (e.g., material handling, future factory layout) may have a director for every factory. Another, with one general manager to deal with all aspects, has as a technical assistant a production engineer whose field is very wide, covering production control, factory layout, methods, jigs and fixture design, and ratefixing as well as future developments of production engineering. An interesting practice in one firm gave the production engineer line authority as well as a staff function: each factory manager had one assistant factory

manager to deal with output and labour, and another to deal with production engineering aspects.

Generally the path to management and the practice of it is as wide and various as in the U.K. The academic status of managers being appointed today is high in all firms, a graduate engineer or a "Techniker" being the usual qualification needed in an engineering factory. Thus, it is hoped, the creation and practice of new ideas by management will increase for the benefit of the firm and the country.

### **(b) Germany**

As in the U.K., I found the larger firms are those applying the principles of production engineering and organising the factories to obtain benefit of specialisation both on the shop floor and with the staff. The actual existence of a production engineering department, I discovered, was rare but especially in the newer industries (automobile, electrical, chemical) there is usually a section performing some aspect of engineering for production.

For example, in one factory on small series production, a time study department studied all jobs, machining, assembly, individual work, group work, short cycle or long. A jig and tool drawing office designed jigs, etc., and improved methods were sought by all—time study engineers, jig and tool draughtsmen, factory managers, even foreign probationers. In a chemical factory a section was devoted to work handling of man-made fibres in the raw state. In an electrical factory mass production of refrigerators was highly organised and engineered. In other factories, there was apparently little attempt to improve methods and conditions on those of many years ago, apart from what the manager could find time to do amongst his other duties.

The efficiency of German management, together with the engineering inheritance, have often been quoted as reasons for the prosperity of West Germany since the War. I would say thoroughness of application, rather than original thought, characterises German organisations of factories and the efficiency of management means that the workmen work hard and conscientiously (including the younger men) for relatively low wages. For example, a locksmith earns approximately £9 0s. 0d. a week, but the cost of living is approximately the same as the U.K.

As mentioned above, the managers are usually promoted within their own particular speciality and cross-posting between departments is not known, as far as I could gather.

A high social status is given to managers, but whether this improves the practice of the job is unknown. In a society where class structure is still definable, the seeking to improve one's self socially may affect the effort put into one's job.

## **conclusions**

After this opportunity to live and work in a foreign country, what conclusions can one draw? In general, people considered as individuals are the same, with similar hopes and fears in their daily life, and a natural friendliness regardless of nationality.

In the particular fields of production engineering and management, the Continental countries, with their long history of education in technology as an academic subject, give a high social and industrial status to a qualified engineer. A manager is expected to be qualified in his particular field; that the two are inter-related is evident from the engineers who become managers. To have seen a firm where the post of financial director was held by an engineer, is to have seen the practical recognition of the engineer's training.

I suggested in my original Paper that liberal arts or classics are not an adequate education or mental discipline for the executive or leader today. The ways of thinking induced by the study of production engineering are those required for an effective manager; on the Continent this is realised and a man is educated in, trained for and allowed to practise these studies. His reward, though initially financially better than in the U.K., is in following a distinguished profession and a satisfaction of helping his country to improve. I suggest there is a strong connection between the training and status of engineers in Western Germany and that country's prosperous emergence from the apathy and defeatism of 1945-48. When the production engineer, with his concern for men, material and machines, achieves the same status here, perhaps we will quicken and improve the current changes in the economic and industrial life of our country.

#### acknowledgments

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To the Institution for, by the award of the Schofield Travel Scholarship, making this trip possible and to the staff of the Institution for their detailed help in arrangements.

To the firms I visited for their kindness and hospitality in receiving me. Especially, I must thank:

Maschinenfabrik Oerlikon	Zurich
Tarex	Geneva
Henschel und Sohn	Kassel

the three host companies, and

Herr Georg Herren and Doctor H. Diem of Zurich

M. Ernest Hoesli of Geneva, and

Dr. Werner Junk of Kassel

for the way they shepherded me through their particular factories.

To Frau Kleiner of Zurich, Madame Châtelaine of Geneva and Frau Schwenck of Kassel, my three landladies who attended to my bodily needs.

To the many Swiss and Germans I met whose friendship and hospitality did much to overcome the language barrier.

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M. Cranston

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G. Solovaytchik

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G. Mikes

Charterson Ltd.

Oxford U.P.

Wingate

#### *Germany 1955*

Fodor	Newman Neame
<i>The Atlantic, March 1957</i>	Boston, Mass., U.S.A.
<i>Industrielle Organisation 1953</i> No. 9	

(Education of Production Engineers)	Federal Polytechnic, Zurich
30 Jahre A.D.B. (30 years of the association of German Production Engineers)	V.D.I., Dusseldorf

#### Institutions and Firms Visited

##### **Switzerland**

Brown Boveri	Baden
Electrical Engineers	
Escher Wyss	Zurich
Turbines	
Gardy	Geneva
Electrical Switchgear	
Maschinenfabrik Oerlikon	Zurich
Electrical Engineering	
Paillard	Yverdon
Cine-cameras and Typewriters	
Patek, Phillippe & Co.	Geneva
Watchmakers and Jewellers	
Sulzer	Winterthur
Diesel Engineers	
Tarex	Geneva
Automatic Lathes	
Tavaro	Geneva
Sewing Machines	
Werkzeugmaschinenfabrik Oerlikon	Zurich
Machine Tools and Armaments	
Winkler Fallert	Berne
Printing Presses	
Centres d'Etude Industrielle (International Management Institute)	Geneva
E.T.H. & Betriebs Institut (Federal Polytechnic & Industrial engineering department)	Zurich
International Office of Education	Geneva
International Labour Organisation	Geneva
Swiss Industries Fair	Basel
U.N.O.	Geneva

##### **Germany**

A.E.G. & High Voltage Institute	Kassel
Refrigerators, Insulators and Switchgear Manufacturers	
Gebruder Crede & Co.	Kassel
Railway Waggons, Trams and Fork Lift Trucks	
Henschel & Sohn	Kassel
Locomotives, Lorries, Heavy Vehicles and Machine Tools	
Spinnfaser	Kassel
Conversion of cellulose to staple fibre	
Wegmann & Co.	Kassel
Railway Waggons, Bogies and Tenders	

# ASSOCIATE MEMBERSHIP EXAMINATION, 1958

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Thomas H. Archer  
Robert Batty  
Roma P. Bhanja  
Eric Brown  
R. J. Butler  
S. Chakravarty  
R. Chellapa  
J. McDonough Creais  
Frank Cuncliffe  
Eric G. Davis

John Dillon  
Trevor S. Evans  
Curwen L. Griffiths  
John H. Henson  
Robert A. Holmes  
Kenneth E. T. Hopkins  
Frederick Howie  
Michael G. Jackson  
Eric Johnson

Hermann Kauders  
David C. Loudon  
R. H. Lowres  
John D. Noble  
Leonard Nowell  
Philip D. Pile  
Horace Proffitt  
John W. Purdie  
Frank C. Ralph

Mohinder P. Sood  
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Roy Sullivan  
Kenneth W. Topiiss  
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Francis D. Duffin  
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Timothy N. Gilbe  
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Richard Heygate  
D. R. Hipkin  
Malcolm L. Howell  
R. H. Lowres

Joseph Lyon  
Alan M. Marshall  
Derek P. Matthams  
Cecil H. Podmore  
E. J. Pound  
Eric E. Read  
John F. Reeves  
Albert Rowden

John H. Salt  
Arthur Spence  
Richard K. Stephenson  
Eric L. Talbot  
Kameshwar P. Tandon  
Frank E. White  
Douglas Whitehead  
Donald F. Wilce

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Raymond Dixon  
N. A. Dilley  
Anthony F. D'Souza  
William J. Dunn  
G. Ellis  
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William M. G. Evans  
George H. Farnworth  
James V. Flynn

Austin L. Fox  
John M. George  
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Eric J. Hathaway  
Arthur S. Hayes  
Geoffrey F. G. Hinings  
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Frank H. Jenner  
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George D. Kendrick  
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Colin C. Kitchener

Frank Knighton  
Derek Laxton  
Derek Lockwood  
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Thomas C. Bates  
V. Chandrasekaran

Konstantins V. Grivainis  
Raj P. Kakkar  
Kartar S. Khothar

K. L. Manocha  
Lajpat Rai

Syed Safiruddin  
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## PASS LIST — PART II (Overseas Candidates)

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Kevin Campbell  
Boyd Einsiedel

Konstantins V. Grivainis  
Mohd G. Ali Khan  
Harbans Lall  
Robert J. Rainey

Dwarka N. Rakhrá  
Pearay K. Tikku  
Mohd A. Wahid

Syed A. Warsi  
Roy Young  
Francis P. Ziegler

## PASS LIST — PART III (Overseas Candidates)

Kalyan K. Chatterjee  
Biswa N. Ganguly  
Frederick D. Hall

Harbans Lall  
Kenneth H. Jones

Mohd G. Ali Khan  
Dwarka N. Rakhrá

K. Ratnakar Rao  
S. Shanmugam

# EXTRACTS FROM REGION AND SECTION REPORTS

Presented to Council, 30th October, 1958

## EAST AND WEST RIDINGS REGION

### Doncaster

The Section have arranged a very attractive programme for the 1958-1959 Session.

It is hoped that the members of the Institution living in the area, but at present members of other Sections, will give active support at all lectures.

### Halifax and Huddersfield

The lecture meetings for the coming Winter Session have been arranged and the Committee are looking forward to increased attendances. Two of the lectures are to be held at the new Percival Whitley Technical College.

The Committee are hoping that invitations extended to the Chairman of Council, Chairman of the Membership Committee, and the Education Officer to visit Halifax in the near future will be accepted, and that the matter of Graduate membership can then be discussed.

### Halifax and Huddersfield Graduate

The Section has held no meetings during the Summer; activities begin again in October.

At the last Regional meeting the Section Chairman was interested to hear of the Sheffield Graduate Committee's comments on the Schofield Scholarship and passed on his own views to the Sheffield Secretary.

### Leeds Graduate

No activities have taken place since the last report, except that the programme for the 1958-1959 Session has been finalised as follows:-

1. Works Visit to Messrs. Samuel Fox, Sheffield.
2. Works Visit to Messrs. British Jeffrey-Diamond Ltd., Wakefield.
3. Film Show in Leeds.
4. Works Visit to a Glass Fibres Factory.
5. Works Visit to Messrs. Slazenger, Wakefield.

A continuation of last Winter's good attendances is anticipated.

### Sheffield

The three months under review have been quiet, and only two Committee meetings were held, due to members being on holiday. Seven applications for membership or transfer were considered during this period.

The Winter programme is completed, beginning with the Annual Dinner in October, and continuing with lectures on Budgetary Control, Argon Arc Welding, Non-Destructive Testing, Fuel and Refractories, and New Moulding Techniques. The Paper to be presented at the Regional Lecture to be held in Sheffield on 9th March, 1959, is entitled "Ergonomics in Industry".

### Sheffield Graduate

Since preparing a special report on the applications for Schofield Scholarships, further discussion has taken place on comments received from the Awards Sub-Committee, and

from Mr. Scholes, who was a successful candidate. Apart from minor points the report was confirmed and it is felt that a copy should be sent to all Sections, asking them to discuss the problems involved.

The Committee have made the further suggestion that instead of being open to Graduates only, any member who is under 35 years of age (i.e., the Graduate age limit) be entitled to enter. The reason for this suggestion is based on the fact that many of the best and most likely candidates for this award are quite experienced in their particular lines and thus are in the higher age groups, say, 27 to 35 years of age. Many of these young men having the qualifications for the Scholarships have experience and positions such that they are no longer Graduates and at 28 years of age they quickly transfer to Associate Member for obvious reasons. Thus many of the best prospects are eliminated.

A full series of practical lectures have been organised for the present programme and a good start has been made with a lecture on "Air Gauging".

Other programmes include Gear Production, Cigarette Production, Precision Casting, Metallurgical Research and, in March, a lecture and demonstration on Closed Circuit Television in Industry. Another successful season is anticipated.

## MIDLANDS REGION

### Regional Report

On 3rd September, the Midlands Region Committee acted as hosts on behalf of the Institution to the Eighth General Assembly of the International Institution for Production Engineering Research, at a reception and dinner at The Regent Hotel, Leamington Spa. The evening provided ample opportunity for the assembly to meet informally in an atmosphere of extreme cordiality. After a short speech of welcome from Mr. H. Tomlinson, Regional Chairman, Mr. E. W. Hancock, O.B.E., Past President, toasted the guests, and the response was made by Professor E. Bickel, President of C.R.I.P.

The Regional Paper, to be presented at Wolverhampton on 3rd December, 1958, will be given by Herr L. Schuler on "Transfer Presswork" and will describe the progress being made in the metal forming industries with use of advanced press and tooling techniques.

The 1958 Viscount Nuffield Paper, to be presented in Birmingham on 11th March, 1959, will be entitled "The Production, Fabrication, Properties and Uses of Some of the Newer Metals", by Dr. N. P. Inglis.

The Regional Dinner will be held also in Birmingham on 17th April, 1959.

The Regional One-Day Conference will be held in Coventry on 6th May, 1959. It will be the third in the current series with a theme depicting a particular aspect of production engineering, and will have the title "Measuring—Tomorrow's Production".

From the foregoing, it will be seen that the Midlands Region has again embarked upon a full and ambitious programme for the 1958-1959 Session.

### Birmingham

Since the previous Report the only corporate activity has been the Summer Convention on 21st June. It was held at Stafford, and included a visit to Messrs. English Electric Co. Ltd. Several parties were conducted round the works and were shown the products of the Company under construction. These included artificially-cooled generator units for many power stations at home and abroad. The Company then entertained the members and their friends to lunch, the company being not far short of 100.

The afternoon was spent at Ingestre Hall, the home of the Earl and Countess of Shrewsbury. Members inspected the house, church and gardens and eventually enjoyed tea in the old stables under the avuncular gaze of the Social Secretary, Mr. Lawton.

Activities for the coming Session are well in hand, and arrangements to celebrate the 25th year of the Birmingham Graduate Section by a joint meeting of special interest have been made.

### Birmingham Graduate

Even though the Section had very little to offer its members by the way of visits and lectures during the Summer months, the Committee have nevertheless been busy with the final arrangements for the 1958-1959 Session. This is the 25th year of the Birmingham Graduate Section; and since it was also the first Graduate Section of the Institution to be formed, the Committee felt that it would be appropriate to celebrate this landmark in its history by organising a programme of lectures and visits that would be in keeping with this rather special year. Full details will of course be published in the monthly News Letter, so that all Section members will be informed well in advance.

The most important date in the Section Programme is in January, when the Section will be honoured by a visit from the President of the Institution, who will deliver an address at the College of Technology. This event is being held as a joint meeting with the Senior Section.

### Coventry Graduate

The end of the previous Session was noted for two rather unusual events—the first being a lecture given at the A.G.M. on the experiences of Mr. K. J. Miller, one of the Graduates, during a Himalayan expedition, and the other, a visit to a local brewery. During the summer months no lectures or visits were held but a social event, in the form of a treasure hunt, was organised and proved extremely popular.

In view of the very good support, normally a feature of the Section's functions, it is felt that a very full programme for the coming Session is justified. This has, in fact, been verified by the attendance at the first works visit of the Session, to a local company, Unbrako Ltd. An extremely large number of guests were rewarded by a most informative and enjoyable visit, and the committee is confident that the nine forthcoming functions at present arranged will prove equally interesting.

### Worcester

The Section programme for 1958-1959 has been extended and finalised in detail.

With the assistance of the Education Officer, the local technical college has been helped with the setting of the H.N.C. in Production Engineering.

## NORTHERN REGION

### Tees-Side

Activity during the quarter has centred around the lecture programme for the coming year. The programme is now about complete and the Section looks forward to a successful Session.

## NORTH MIDLANDS REGION

### Regional Report

Since the last report, the Region has held the one-day Conference in Leicester, which was attended by over 150 members with their ladies. Details are given in the Leicester Section report. The Conference was held in the Dining Hall of Messrs. A. A. Jones & Shipman Ltd., Leicester, to whom the Region is most grateful for their hospitality and the excellent lunch which they provided.

Both the delegates and their ladies complimented the organisers on the arrangements which made the Conference an undoubted success.

A new officer to the North Midlands Region is Mr. L. Liquorish, A.M.I.Prod.E., who has taken over the Honorary Secretaryship of the Nottingham Section from Mr. C. N. T. Manfull, M.I.Prod.E., who has retired after holding this office for the past 14½ years.

### Leicester

The North Midlands Region One-Day Conference for 1958 was held at Leicester on 7th June last, at the establishment of Messrs. A. A. Jones & Shipman Ltds. The theme of the Conference was "Foreign Competition—The Challenge".

The idea was to provide an opportunity for production engineers and others interested in this vital topic to hear the views of eminent speakers, and discuss with them the many issues and problems involved.

The Conference was opened by The Worshipful The Lord Mayor of Leicester, Alderman S. Brown, T.D. Delegates were welcomed by Mr. L. Shenton, the Regional Chairman.

Mr. E. L. Phillips, of the Board of Trade, gave an address on "Government Policy and World Markets", which was followed by Mr. W. Carron, President of the Amalgamated Engineering Union, developing the theme "Responsibilities and Attitudes of the Trades Unions".

Numerous pertinent questions were put to both speakers, whose answers were both factual and entertaining.

A lecture of direct interest regarding this country's import-export trade was given by Mr. H. A. V. Kirk, of Alfred Herbert Ltd. His address, entitled "A Manufacturer's Approach to the Export and Home Markets", proved to be most stimulating. The final lecture to be given was by Mr. J. E. Chadwick, of the Foreign Office, whose Paper, "The Viewpoint of Our Foreign Competitors" proved to be extremely thought-provoking and interesting.

The final summing-up was given by Mr. H. Burke, in a lucid and masterly fashion, bringing to a conclusion a Conference which all delegates agreed had been most successful.

Arrangements for the wives of delegates were most varied, and included visits to such places as the Leicester Co-operative Society Model Dairy, Belgrave Hall, Botanical Gardens, and a fashion show kindly arranged by the Leicester College of Art.

The final attendance figures were 155 delegates and 53 ladies, making a total of 208.

The 1958-1959 lecture programme has been prepared and it is hoped the interesting series of meetings will result in increased attendances.

This year's Section Annual Dinner will be held on 4th December at the Grand Hotel, Leicester. At the Annual General Meeting, Mr. R. M. Evans was unanimously elected Chairman in succession to Mr. L. S. Pitteway.

### Nottingham

Arrangements for the lecture meeting programme are now complete and the first meeting of the new Session will be held on 1st October, when a Paper entitled "Thermal Insulation of Factories" will be given by Mr. P. P. Muller, of Imperial Chemical Industries Ltd.

The venue for meetings has been changed, and all meetings for the forthcoming Session will be held at the Nottingham Reform Club, Victoria Street, Nottingham.

Owing to private reasons, Mr. C. N. T. Manfull has resigned office as Honorary Secretary of the Nottingham Section, a post he has held for 14½ years. Mr. Manfull in his years of office has served the Institution well, and has been responsible for holding the Nottingham Section together.

As a gesture of the high regard felt for him by his Committee, a presentation in the form of a writing set was made at the August Committee Meeting.

## NORTH WESTERN REGION

### Regional Report

The Regions are pleased to welcome Mr. T. A. Stoddart to the Chair for 1958-1959, and wish him well in his new appointment.

Mr. J. H. Winskill was nominated as the additional representative on Council; Mr. J. P. Speakman was re-elected Hon. Secretary; and Mr. R. S. Clark was re-elected Hon. Treasurer.

Arrangements are well in hand for the 5th North Western Regional Annual Dinner, to be held on Friday, 24th April, 1959, at the Midland Hotel, Manchester.

#### Liverpool Graduate

At the first Committee Meeting of the Session, extracts concerning the notification of lectures to members and visitors were read from the report of the recent Section and Regional Secretaries Conference. The Committee expressed satisfaction at the suggestion to cancel programme booklets, and from this a general discussion evolved concerning the mailing list for visitors' tickets. It was decided to reduce the number of tickets from 200 to 100.

It has been found during the past few years that it is more convenient to send a circular to each member of the Section. This has the advantage that members' notice can be drawn to other activities, such as works visits, etc.

#### Manchester

The Section Committee bring to the attention of other Sections the first-class lecture held in March of this year, entitled "Ceramic Cutting Tools", by Mr. G. R. Connor, when 112 members and guests enjoyed a very well prepared Paper on a comparatively new subject. The Paper is recommended to all Sections; details can be obtained from the Secretary.

Mr. T. A. Stoddart, M.I.Prod.E., of the Manchester Section, has been elected to the Chair of the North Western Region Committee; and Mr. D. H. Sheret has been appointed the new representative on the North Western Region Committee.

#### Manchester Graduate

The Committee have noted and discussed with interest the new card index system being arranged by Head Office. This, it is felt, will assist efforts in recruiting new members for the Committee. It is hoped to have available at some future date the names of all members employed by one particular organisation, so that selection may be made from one of these members. This approach may eventually lead to an increase in attendance at lectures.

The lecture programme for 1958-1959 has been arranged.

#### Stoke-on-Trent

The lecture programme for the coming Session has been satisfactorily completed and the Committee is looking forward to an interesting series of talks and discussions.

The opening lecture will be "An Introduction to Patternmaking in Plastics" by Mr. H. G. King, a member of the United Patternmakers' Association. An invitation has been extended to the members of the local branch of the Association to be present. The Committee is also looking forward to the presence at the lecture of Mr. Ellis Smith, M.P. for Stoke-on-Trent (South), who is President of the United Patternmakers' Association.

The Committee has felt that the number of serving members has been on the minimum for too long and, therefore, new members in industry are now being co-opted to increase active membership of the Section. They have been pleased to welcome during recent months Messrs. T. Proctor and G. E. Crick, both of the Michelin Tyre Co. Ltd.

### SOUTHERN REGION

#### Oxford

During the last quarter no general meetings were arranged, but considerable Committee work has been done in connection with the 1958-1959 Lecture Programme.

The theme arranged for the Oxford Section for the coming year is under the heading: "The Impact of European Free Trade on British Industry", and seven Papers are arranged around this theme.

Due to the rather ambitious nature of this project, introducing as it does a new aspect of industry likely to have considerable effect on production engineering of the future, and further introducing some completely new and fresh speakers to the Institution, some difficulty has been experienced in making final arrangements.

#### Reading

A most enjoyable works visit was made by 24 members on 19th June to de Havilland Aircraft Co. Ltd., Hatfield. A very interesting programme was arranged to show production in various stages of the latest "Comet".

It is hoped that the lectures arranged for 1958-1959 will be as well supported as in the last Session. Six lectures will be held, one each at Basingstoke, Staines and Newbury, and three at Reading. In addition to these there will be an "Open Forum" evening at Reading. As has been the practice in the past, one of the lectures will be held jointly with the Local Productivity Association.

#### Southampton

The Southampton Section Committee have purposely cut down their number of lectures for this Winter and plan to hold four only, and look forward to increased member support. The programme for the next Aircraft Conference, to be held in April, 1959, at Southampton, is now complete. The Committee expect this Conference to be well supported at all levels.

### SOUTH EASTERN REGION

#### Regional Report

Arrangements are now in hand for the South Eastern Region Graduate Prize for 1958-1959.

The number of entries for the 1957-1958 competition, although small, was encouraging in comparison with national schemes such as the Schofield Travel Scholarship.

The South Eastern Region Committee agree with the recommendation of the Finance and General Purposes Committee that Regional Lecture Programme booklets should be discontinued.

They feel, however, that each Section should issue programmes which should include a note of all Regional functions to encourage participation in Regional activities.

#### London

Arrangements for a full lecture programme covering a wide variety of subjects such as: "Human and Organisation Problems in Inspection Departments"; "Planned Maintenance of Electrical and Mechanical Equipment in a Paper Mill"; "A Laboratory Technique for Precision Machine Tool Geometry"; are complete. There will be three lectures held at Brighton, two at Croydon, and five at the Royal Commonwealth Society.

The Lecture Sub-Committee are also well in advance with arrangements for the following season's activities which it is hoped will prove as interesting as the forthcoming programme.

#### Luton

As this is the normal period of recess, there have been no monthly meetings of the Luton Section during this last quarter. The Committee, however, have met to finalise the lecture programme for the 1958-1959 Session, and are confident that subjects of interest will be provided once again for all members, continuing the Committee's policy of holding meetings at the major centres of activity in the district—Luton and Bedford, St. Albans and Letchworth.

Due to the assistance of Mr. Kelly and his colleagues, an interesting visit was made to the vacuum cleaner plant of Messrs. Electrolux (Luton) on 6th September. This was well attended and proved to be so absorbing that time was not available to continue the advertised tour to the companion refrigerator plant.

#### Luton Graduate

Our Newsletter No. 8 to all Section members (Senior and Graduate) introduced this year's Committee and its projected programme for the coming year, which should prove of general interest to all. The highlight is likely to be an all-day visit to Vauxhall Motors, Luton. The Newsletter also requests members to fill in the questionnaire being circulated from Headquarters.

There is a larger Section Committee than last year (seven members as against four) and all are extremely keen. The Committee wish to put a proposal before the next Senior Section Committee aimed at fostering greater interest in the Institution amongst the local apprentices.

With reference to the Report on the Secretaries' Conference held recently, this Section wonders if it is generally appreciated by members that the area in which they work is the nominal area of their membership. The replies to the Head Office questionnaire may show that this principle fails to apply in all cases. Perhaps some comment could be made in a future issue of the Journal, as many members may not be in the Section most convenient to them.

#### **Rochester**

All arrangements are in hand for the new Session. Every encouragement will be given to members, by personal contact, wherever possible, to provide Head Office with the information required on the cards recently circulated.

Encouragement will also be given to "take the plunge" so far as preparation of new Papers is concerned.

#### **Rochester Graduate**

In the 1958-1959 Session, the Section is again holding four Graduate lectures and two works visits, plus a combined Senior and Graduate Annual General Meeting and film evening. It is hoped that one of the lectures, on "Lens Manufacture", will be followed up with a visit to a local firm, Messrs. Leech (Rochester) Ltd., optical manufacturers.

As during the last Session, lectures will again be held alternately in Maidstone and Rochester, to cover the main centres of membership.

#### **South Essex**

The Section has not held any meetings or activities during the Summer months, and the only item to report is that arrangements have been completed for the 1958-1959 Winter programme. This commences with a Paper, "Russia's Approach to Production of Machine Tools and Associated Equipment", by Norman Stubbs, Editor of "Metalworking Production".

Meetings will be held in Chelmsford, Ilford and Southend-on-Sea during the season.

### **SOUTH WESTERN REGION**

#### **Western**

During the Summer months there has been no Section activity although the Committee has been working very hard.

The Committee is endeavouring to complete a list of all members with their business addresses so as to make full use of the posters used to advertise Section lectures, especially as lecture programmes are being discontinued.

The Committee has also decided as a policy to reduce the number of lectures to the minimum but to make sure that those held are of the right level and on subjects of most interest. Furthermore, it is thought that as the number of professional institutions is growing with the consequent increase in the number of lectures, it would be more profitable to all concerned if joint meetings were held and the Committee are, therefore, arranging a programme on these lines.

As is the usual custom, only one social event will be held during the year and this will be the Annual Dinner and Dance on 20th November, 1958.

#### **Western Graduate**

A combined lecture will be given on 11th February, 1959, to the Graduate Sections of the Institutions of Production Engineers and Mechanical Engineers, Western Section. The lecture has been arranged (at the invitation of the Mechanical Graduate Section) by the Committee, and is entitled "Vacuum Investment Casting".

### **WALES REGION**

#### **Regional Report**

During the past quarter the new Regional Committee has been elected and had its first meeting. It is with regret that the resignation is reported of Captain V. J. Sankey, who has been such an inspiration to both the West Wales Section and the Regional Committee. Mr. H. Dixon, of the Cardiff Section, was elected Regional Chairman for the ensuing year.

The Committee decided that no conference would be held this year, but efforts would be made to hold one joint lecture meeting at Cardiff and Swansea respectively, in order to continue the close collaboration of the two Sections which was fostered so successfully by the one-day Conference.

#### **Cardiff**

During the past quarter the Secretary has been finalising the lecture programme for the 1958-1959 Session. Much care has been taken in the selection of subjects to ensure that the high standard of previous years is maintained, and it is hoped that the record attendances of last year will again be surpassed. The Committee are particularly keen to obtain the co-operation of all members to publicise, wherever possible, details of forthcoming lectures.

During the forthcoming lecture programme, the Section will be honoured by a visit from Mr. H. W. Bowen, O.B.E., Chairman of Council.

The venue for lectures will again be the South Wales Institute of Engineers.

Liaison with the technical institutions continues to grow stronger and facilities for meetings, lectures, etc., have been offered by several institutions.

Election of Regional Officers has taken place and the Section is again assured of a good representation on the Regional Committee.

The Section Committee accepted an invitation by the Directors of Messrs. A. B. Metals Co., Abercynon, to visit their factory, and a very instructive and enjoyable time was had by all.

#### **Swansea**

The Swansea Section held a very successful Annual General Meeting, and the Officers for the coming year were elected.

The Committee have again been very active during the Summer recess, in arranging a varied and interesting lecture programme for the Winter months. This programme includes such titles as: "New Safety Factors As They Affect Production Engineering"; "Photography in Engineering"; "Relationship Between the Salesman and the Production Engineer"; "Properties of Pure Molybdenum Disulphide and its Application to Production Engineering"; and "Unconventional Tooling".

The Committee have also reason to be pleased with the success of the one-day Conference held in April this year, which they feel is responsible for the large number of applications for membership of the Institution in this Section.

### **SECTIONS OUTSIDE THE UNITED KINGDOM**

#### **Adelaide**

There is no progress to report in the negotiations with the Adelaide University to establish a production engineering course. It is possible that the whole scheme will be reviewed by the Section Committee with the purpose of making a different approach.

The pattern which is being followed in the monthly lectures has proved attractive as meetings have been well attended.

There is a slow but steady increase in Section membership, although this is offset to some extent by transfers to other sections.

Arrangements for the J. N. Kirby Paper, to be given by Professor Marcus Oliphant on 4th November, are well in hand and indications are that it will be well attended.

#### **Bombay**

At the Section meeting on 3rd July, a very interesting talk was given by Professor V. E. Push, of the Western Indian Institute of Technology, Bombay, on "Present Trends in Machine Tool Building". Professor Push is a Russian by nationality and his services have been lent to the above Institute by the UNESCO authorities. He dealt with the subject in a masterly way, particularly mentioning the developments taking place in U.S.S.R.

On 12th July, a visit was arranged to the works of Godrej & Boyce Mfg. Co. Ltd. This firm of late has expanded its activities in new fields, such as the manufacture of typewriters and domestic refrigerators. They are the only people manufacturing these items in this country and the visit proved to be quite interesting. Unfortunately, it was raining very heavily that day and quite a number of members could not take advantage of this visit, as some of the roads were impassable.

On 22nd July, Mr. A. Miller, the present Section Vice-Chairman, read a Paper entitled "Design and Its Developments" which was much appreciated by those present.

At the meeting held on 31st July, the Committee decided to join the newly-formed Bombay Productivity Council, recently sponsored on behalf of the Government of India.

The visit on 5th August to the Machine Tool Prototype Factory proved to be very interesting. This factory manufactures lathes and other machine tools of high precision and members were very pleased to have the opportunity of going through a works of this kind.

On 12th August, a Paper was given by another UNESCO speaker, Professor V. I. Yavoisky, of the Western India Institute of Technology, entitled "Iron and Steel Industry in U.S.S.R.". Professor Yavoisky is considered to be an expert designer of integrated steel plants and has had published many works on the subject.

On 8th September, a meeting has been arranged with the Executive Committee of the Indian Standard Institution (Bombay Section) to discuss "Standardisation and Production".

A visit has been arranged in September to the works of National Machinery Manufacturers Ltd., pioneers in the manufacture of textile machinery in this country.

#### Calcutta

The Calcutta Section has had a most interesting and successful quarter. The Committee decided that six months would be devoted in a concentrated manner to the subject of "Productivity Promotion".

The first Section meeting on this subject was held on 19th July. A new approach was made in that a works visit was combined with the reading of a Paper. Section members and guests arrived at the Jay Engineering Works at 2.30 p.m. and, after a most interesting tour of the works, assembled in the air-conditioned lecture room. Mr. T. R. Gupta, the General Manager of Jay Engineering Works and the Section Chairman, then read his Paper, "We Too Can Do It", which had already been circulated to all Section Members. Question time was lively and constructive and most of the 85 members and guests present expressed their thanks for a most successful meeting.

The second Section meeting was held on Saturday, 6th September. This took the form of a film show in the air-conditioned Lighthouse Miniature Cinema. Seven films on "Productivity Promotion", supplied by the British Information Service, were shown. It was unfortunately necessary due to the limited accommodation, to restrict the number of guests, but 60 members and eight guests were present. Amongst the latter were the Chairman of the Indian Engineering Association, the President of the Institute of Cost and Works Accountants, and the Head of the British Information Service from the U.K. High Commissioner's Office. The show was a great success and another step towards the Committee's goal of selling the importance of "Productivity Promotion".

The Section Chairman and Honorary Secretary attended an informal meeting on 4th September in connection with the setting up of the National Productivity Council. Another meeting is scheduled to take place during the month.

The Committee is paying close attention to Graduates and Students. A library of production engineering subjects is being built up and arrangements are being made for the more senior members to lecture the Graduates and Students on production engineering. Arrangements are also being made to exhibit the films on "Productivity Promotion" in Madras and Jamshedpur, so that out-of-town Section members, who are unable to travel the long distances into Calcutta, may also derive some benefit from Section activities.

The Calcutta Section has been invited by the Indian Standards Institution to send representatives to the Annual Convention in

New Delhi in November. The Section Chairman and Honorary Secretary will attend.

#### Melbourne

The Melbourne Section has had three meetings this quarter. On 11th June, 75 members gathered to hear Mr. H. H. Hoch, Dipl.Ing., M.I.Prod.E., speak on "Can Work Study Benefit Small Factories?". Mr. Hoch is the Manufacturing Manager, Sutton Tool & Gauge Manufacturing Co.

On 9th July, a Paper was presented to members entitled "Machining with the Abrasive Belt" by Mr. F. R. Richards, B.Sc., Product Engineer, Behr-Manning (Aust.) Pty. Ltd.; 70 members attended this meeting.

At the meeting on 13th August the speaker was Mr. A. D. Pead, A.M.I.E.(Aust.), A.M.I.Prod.E., whose subject was "Recent Development in Production Engineering Practice, Research and Education". Mr. Pead has recently returned from overseas where he made a study of that subject.

The Section's Productivity Group has been active over this period and has now formulated a plan to make industry more aware of this subject. The plans being considered are along the lines of the "Circuit Scheme" which has been successfully used in England.

#### Melbourne Graduate

On 16th July, the Section visited the bolt works of McPherson's Ltd. This Division of McPherson's Ltd. produced the bulk of the standard bolts, nuts, rivets, etc., used in Australia. The interesting processes seen included hot and cold heading; thread rolling; and second operation work on automatic and semi-automatic machines.

The excellent supper arrangements made by the Company enabled those present to participate in an enjoyable social meeting.

The policy of the Section has been to organise one visit per year to a company engaged in an industry other than engineering. This year, on 20th August, the Section visited Abbotsford Brewery.

The evening commenced with a half-hour film showing the beer brewing process. A tour of the works followed, covering malt extraction; hop addition; fermentation cellars; storage cellars; filtration; bottling. The bottling department proved to be of particular interest, the Abbotsford Brewery having recently installed a modern automatic bottling plant.

At the conclusion of the tour those present were invited to supper, and to sample the Company's products.

#### Sydney

With only one more monthly meeting — the Annual General Meeting in October — it is considered the lecture programme this year has been most successful, both in the choice of speakers and subjects, and in the interest exhibited by the generally larger numbers attending.

In July, Professor J. F. Clark, Professor of Applied Psychology, N.S.W. University, spoke on "Industrial Psychology"; followed in August by a lecture on "Electronic Computer Aids to Production Planning and Control" from J. M. Smallwood, of I.B.M. Pty. Ltd.

The subject "Hydraulics in Automation" was thoroughly covered by Mr. W. R. Fanning, of Vickers Detroit Hydraulics Pty. Ltd., at the September meeting.

For some time the formation of a Graduate Section in Sydney has been under discussion. As a further step a survey is being made to assess the general feeling of Graduates and Students, and particularly to find those ready to accept office in a Graduate Section.

## VARIETY REDUCTION ESSAY PRIZE COMPETITION

To encourage the study of Variety Reduction, the British Productivity Council has decided to promote a Variety Reduction Essay Prize Competition. The Competition will be divided into two categories — the first being an Open Competition, for which a prize of up to 150 guineas will be awarded, and the other being a Student Competition for which a prize of 15 guineas will be awarded. Additional prizes may be awarded for Papers in either category if, in the opinion of the British Productivity Council, such awards are merited.

### *Open Competition*

The Paper should be of a high standard and should show original thoughts on Variety Reduction. The essay should not exceed 10,000 words and should be in a form suitable for a public lecture. Entries must be typed and submitted in quintuplicate.

### *Student Competition*

This is open to those undertaking professional studies or who have completed professional studies but who are not yet corporate members of a professional institution. The essay should not exceed 5,000 words and should be typed and submitted in triplicate.

### *Competition Rules*

1. Essays awarded prizes in both categories will become the property of the British Productivity Council and may be published by them in whole or in part. An essay, or part of an essay, published will become the copyright of the British Productivity Council.
2. The essays submitted will be judged by a panel set up for the purpose by the Joint British Productivity Council/British Standards Institution Committee for Variety Production. This panel will be unaware of the identity of the entrants. The decision of this panel will be final.
3. The British Productivity Council reserves the right to withhold the award of any prize if, in the opinion of the panel, there is no essay submitted meriting the award.
4. A clear summary of not more than 100 words must be provided at the beginning of the essay.
5. The source must be given of all quotations contained in the essay.
6. Essays must reach the British Productivity Council by 30th April, 1959, in the case of the Student Competition ; and by 31st July, 1959, in the case of the Open Competition.
7. Each essay must have a cover sheet giving the following information :
  - (a) the category of competition for which the essay is submitted;
  - (b) title of essay;
  - (c) name and address of entrant.

The essay should be sent to the following address : The British Productivity Council, 21 Tothill Street, London, S.W.1.

## QUALITY CONTROL — INTRODUCTION OF NEW SERVICE

The use of the techniques of Quality Control has grown rapidly in recent years and with the development of new materials and new methods of production is likely to become very much more important in the future. The Free Trade Area proposals and the European Common Market have brought to the fore the desirability of an international appreciation of standards of Quality and the use of Quality Control Procedures. In view of this need the European Productivity Agency has been responsible for setting up the European Organisation for Quality Control, with headquarters in Rotterdam. This body has now invited one organisation from each country belonging to E.P.A. to become the full national member and the British Productivity Council has been appointed to represent the United Kingdom on the management of the E.O.Q.C.

The activities of the E.O.Q.C. are likely to be of interest to all firms, not only those exporting to the Continent, also to trade associations and to professional institutions, universities and technical colleges. Membership confirms the right :

- (a) to receive information on all projects (the first of these, dealing with sampling procedures, is already being developed) ;
- (b) to receive copies of the E.O.Q.C. Bulletin (published quarterly) which will report developments on quality control techniques in all countries ;
- (c) participation in a question and answer service ;
- (d) co-operation with the American Society for Quality Control ; and
- (e) the opportunity to attend conferences organised by E.O.Q.C.

In order to bring the advantages of membership of the E.O.Q.C. to as wide a section of British industry as possible, and to ensure continuing membership, the British Productivity Council is instituting a subscriber service to which all organisations interested in Quality Control are invited to participate.

Full details of the subscriber service can be obtained from the British Productivity Council, 21 Tothill Street, London S.W.1.

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*Members interested in this subject are reminded that copies of the Report, "Quality — Its Creation and Control", may be obtained from :*

THE PUBLICATIONS DEPARTMENT,  
10 CHESTERFIELD STREET,  
MAYFAIR, LONDON, W.1.

**THE PRESIDENT AT SHEFFIELD**



On 20th October last, the President of the Institution, The Rt. Hon. The Earl of Halsbury, F.R.I.C., F.Inst.P., M.I.Prod.E., attended the Annual Dinner of the Sheffield Section. In the photograph above, Lord Halsbury is seen with the Section Chairman, Mr. F. W. Woodifield, and other guests. From the left are : Mr. R. S. Fearneough; Mr. A. A. Part, M.B.E. (Under Secretary, Ministry of Education); Lord Halsbury; Mr. Woodifield; The Lord Mayor of Sheffield; and Mr. J. H. Neill, the Master Cutler.

During his stay in Sheffield, the President also visited the works of Edward Pryor & Son Ltd. The photograph below shows Lord Halsbury taking a keen interest in an engraving machine. On the right is Mr. G. Ronald Pryor, Vice-President of the Institution.



**TEXTBOOKS ON PRODUCTION ENGINEERING**

A list of textbooks on production engineering, prepared for the use of candidates for the new Associate Membership Examination, commencing in 1960, is now available.

Copies may be obtained, free of charge, on application to : The Membership Department, The Institution of Production Engineers, 10 Chesterfield Street, Mayfair, London, W.1.

**WHITWORTH FOUNDATION AWARD, 1959**

The Ministry of Education announce for competition in 1959 three Whitworth Fellowships, tenable for two years, and of value £500 a year.

To be eligible, a candidate must be a British subject and possess an Engineering Degree of suitable standard, or have a Higher National Diploma or Certificate in Engineering with at least two distinctions. Practical training must also have been received for at least two years.

The Fellowship can be used to cover at least two years of further training in industry or post-graduate study or research. Forms 50FE, giving details of the 1959 Awards, have been issued by the Ministry of Education, and "Rules and Conditions for the Award of Whitworth Fellowships and Prizes" may be obtained, price 3d. net (by post 5d.) from : H.M. Stationery Office, York House, Kingsway, London, W.C.2, or through any bookseller.

**THE CHAIRMAN AT CARDIFF**



The Chairman of Council, Mr. H. W. Bowen, O.B.E., visited the Cardiff Section on 24th October last, and gave a short address on "The Institution". This photograph shows Mr. Bowen (centre) being greeted by Mr. H. G. H. Dixon, Chairman of the Cardiff Section. On the left is Mr. C. Ll. Griffiths, Honorary Secretary of the Section.

## news of members

**Mr. E. F. Gilberthorpe**, Member, has been appointed Works Manager of Bristol Aircraft Ltd., Weston Division. Mr. Gilberthorpe is a Member of Council.

**Mr. A. Sewart**, Member, has now been appointed Assistant General Manager (Missiles) at A. V. Roe & Co. Ltd.

**Mr. L. Baker**, Associate Member, has relinquished his position with Hamworthy Engineering Ltd., and has been appointed Deputy Managing Director of Coventry Gauge & Tools Co. Ltd., Coventry.

**Mr. P. A. Broadbent**, Associate Member, has been transferred from Birfield Industries Ltd., to take up the position of Works Manager of the Phosphor Bronze Co. Ltd., Birmingham.

**Mr. R. J. Dawes**, Associate Member, has now been made a Director of Bush & Wilton Ltd., Bristol.

**Mr. M. W. Hall**, Associate Member, has been appointed Managing Director of Davis & Timmins (Aircraft) Ltd., London.

**Mr. S. G. Hayden**, Associate Member, has relinquished his position with Wade Engineering Ltd., Brighton, to take up an appointment of Works Manager with Shunic Ltd., Stevenage, Herts.

**Mr. N. Sherrington**, Associate Member, has relinquished his position as Planning Engineer with the East Anglian Engineering Co. Ltd., Lowestoft, and has now joined Balding Engineering Ltd., Norwich, as Chief Planning Engineer.

**Mr. G. C. Twine**, Associate Member, has relinquished his appointment of Work Study Manager with John Knight Ltd., and has recently taken up a similar position with Lever Brothers (Nigeria) Ltd., Apapa, Nigeria.

### CORRESPONDENCE TO HEAD OFFICE

There have been quite a number of instances where post intended for Head Office has been delayed, due to the fact that the envelopes have not been clearly addressed, and it may also be assumed that, for the same reason, a number of letters do not reach this office at all.

There are quite a number of places in London which include the name "Chesterfield" in their address, for example, Chesterfield Gardens, W.1., Chesterfield Road, W.4, etc. Delivery of correspondence to Headquarters can only be guaranteed if the envelope, or other package, is accurately addressed. The word "Street" must be written in full, as the abbreviation "St.", when in manuscript is frequently — and understandably — read as "Sq." or "Pl.", and is delivered accordingly with consequent delay. In order to help overcome this problem, it is intended in future, to include the word "Mayfair" in the Institution's address.

Any mail being sent to the Institution must be addressed as follows:-

THE INSTITUTION OF PRODUCTION ENGINEERS,  
10 CHESTERFIELD STREET,  
MAYFAIR, LONDON, W.1.

### JOURNAL BINDERS

The increased size of the Journal has made impractical the present type of binder, and as a result of requests from members, the Institution is now able to supply the "Easibind" type of binder, in which metal rods and wires hold the issues in place, and which is designed to hold six Journals.

It will be found that copies of the Journal can be quickly and simply inserted into this binder, without damage to the pages, and that binding six issues at a time, instead of twelve, will facilitate easier reference, and handling of the volumes.

The new binders may be obtained from: The Publications Department, 10 Chesterfield Street, London, W.1, price 10s. 6d. each, including postage. Date transfers, for application to the spine of the binder, can be supplied if required, price 6d. each.

# Hazleton Memorial Library

## PERIODICALS CURRENTLY RECEIVED

Aero Research Technical Notes. Duxford, Cambridge, Aero Research Ltd. Monthly. *From No. 1, January, 1943.*

Aircraft Engineering. London, Bunhill Publications Ltd. Monthly. *5 years.*

Aircraft Production. London, Iliffe and Son Ltd. Monthly. *5 years.*

Aluminium Courier. London, Aluminium Development Association. Irregular. *6 issues.*

Aluminium Development Association, London. *See* Aluminium Courier.

Aluminium News. Montreal, Aluminium Union Ltd. Monthly. *6 months.*

Aluminium Union Ltd., Montreal. *See* Aluminium News.

American Institute of Industrial Engineers. *See* Journal of Industrial Engineering.

American Machinist. New York, McGraw-Hill Publishing Company Inc. Bi-weekly. *5 years.*

American Management Association, New York. *See* Management Review.

American Material Handling Society Inc., Toledo, Ohio. *See* Modern Materials Handling.

American Society for Metals, Cleveland, Ohio. *See* Metal Progress.

American Society of Mechanical Engineers, New York. *See* Mechanical Engineering.

American Society of Tool Engineers, Detroit, Michigan. *See* The Tool Engineer.

Andre Rubber Co. Ltd., Surbiton. *See* Torque.

Applied Hydraulics, Cleveland, Ohio. Hydraulics Publishing Co. Monthly. *2 years.*

Arbeitgemeinschaft Deutscher Betriebssingenieure. *See* Werkstatttechnik und Maschinebau.

Arbeitsgemeinschaft für Fertigungstechnisches Messwesen im VDI. *See* Werkstatttechnik und Maschinebau.

Aslib Book-List. London, Aslib. Monthly. *3 months.*

Aslib Proceedings, incorporating Aslib Information. London, Aslib. Monthly. *1 year.*

Aslib, London. *Journal of Documentation*, q.v.

Associated British Machine Tool Makers Ltd., London. *See* British Machine Tool Engineering.

Association des Ingénieurs sortis de l'Université Libre de Bruxelles, Brussels. *See* Revue Générale des Sciences Appliquées.

Association Française des Conseils en Organisation Scientifique, Paris. Bulletin. Monthly. *1 year.*

Associazione Meccanica Italiana, Milan. *See* Rivista di Meccanica.

Austin Technical News: abstracts from the world's scientific and technical press. Birmingham, Austin Motor Co. Ltd. Monthly. *6 months.*

Australian Institute of Management, Sydney Division. *See* Management News.

Australian Institute of Management, Adelaide Division. *See* Management Digest.

Automation. Cleveland, Ohio, Penton Publishing Co. Inc. Monthly. *2 years.*

Automation Progress. London, Leonard Hill Technical Group. *From Volume 1, 1956.*

Automobile Engineer. London, Iliffe and Sons Ltd. Monthly. *5 years.*

B.P.C. Bulletin. London, British Productivity Council. Monthly. *6 months.*

B.S.C.R.A. Abstracts. Sheffield, British Steel Castings Research Association. Bi-monthly. *1 year.*

B.S.I. Information Sheet. London, British Standards Institution. Monthly. *1 year.*

Bacie Journal. London, British Association for Commercial and Industrial Education. Bi-monthly. *From Volume 7, No. 2, March/April, 1953.*

Beama Journal: the official Journal of the British Electrical and Allied Manufacturers Association (Inc.). Monthly. *5 years.*

Bibliography of Industrial Diamond Applications. London, Industrial Diamond Information Bureau. Monthly. *2 years.*

Bibliotech: library bulletin of the College of Technology, Birmingham. Bi-monthly. *1 issue.*

Birmingham College of Technology. Library. *See* Bibliotech.

British Aluminium Co., London. *See* Light Metals Bulletin.

British Association for Commercial and Industrial Education, London. *See* Bacie Journal.

British Cast Iron Research Association, Birmingham. Bulletin and Foundry Abstracts. Bi-monthly. *1 year.*

British Conference on Automation and Computation, London. Bulletin. Two-monthly. *From Volume 1, No. 1, September - October, 1958.*

British Electrical and Allied Manufacturers Association (Inc.), London. *See* Beama Journal.

British Institute of Management, London. Journal. Quarterly. *From Volume 1, No. 1, 1957* (and as British Management Review, *from Volume 11, 1952-3*). From April, 1958, incorporated in *The Manager* q.v.

British Institute of Management, London. Management Abstracts. q.v.

British Institution of Radio Engineers, London. Journal. Monthly. *1 year.*

British Machine Tool Engineering. London, Associated British Machine Tool Makers Ltd. Quarterly. *6 issues.*

British Management Review. *See* British Institute of Management. Journal.

British Plastics. London, Iliffe and Sons Ltd. Monthly. *5 years.*

British Productivity Council, London. *See* B.P.C. Bulletin.

British Radio and Television, London. Monthly. *1 issue.*

British Rubber Development Board, London. *See* Rubber Developments.

British Standards Institution, London. *See* B.S.I. Information Sheet.

British Standards Institution, London. British Standard Specifications. (The Library has a file of those B.S.I. specifications, which are of interest to production engineers.)

British Steel Castings Research Association, Sheffield. *See* B.S.C.R.A. Abstracts.

British Tabulating Machine Co., London. *See* The Tabulator.

British Timken Ltd., Northampton. *See* Timken Times and FBC Bulletin.

British Welding Journal. London, Institute of Welding and British Welding Research Association. Monthly. 1 year.

British Welding Research Association, London. *See* British Welding Journal.

Brush Group, London. Technical Journal. Quarterly. 6 months.

Bureau des Temps Elementaires, Paris. *See* Etude du Travail.

Business, London, Business Publications Ltd. Monthly. 1 year.

C.N.O.F.: Revue mensuelle de l'organisation. Paris, Comité National de l'Organisation Française. Monthly. 1 year.

California Texas Oil Company Ltd., New York. *See* Lubrication; and Oil, Lifesream of Progress.

Central Statistical Office. *See* Monthly Digest of Statistics.

Centre de Documentation de la Mécanique, Paris. *See* Documentation Mécanique.

Centralny Instytut Dokumentacji Naukowo-Technicznej, Warsaw. *See* Polish Technical Abstracts.

Centre de Documentation Siderurgique, Paris. Bulletin Analytique en collaboration avec le Centre National de la Recherche Scientifique. Monthly. 1 year.

Centre de Documentation Siderurgique, Paris. Circulaire d'Informations Techniques. Monthly. 1 year.

Chartered Civil Engineer, London, Institution of Civil Engineers. Monthly. 1 year.

Chartered Mechanical Engineer, London, Institution of Mechanical Engineers. Monthly. 1 year.

Cold Rolled Sections Association, Birmingham. *See* Sheet Metal Industries.

Comitato Nazionale per la Produttività, Rome. *See* Cronache della Produttività; and Produttività.

Comité National de l'Organisation Française, Paris. *See* C.N.O.F.

Compressed Air Engineering. London, John Trundell (Publishers) Ltd. Monthly. 2 years.

Coming Events. Paris, European Productivity Agency. Monthly. 1 year.

Control. London, Rowse Muir Publications Ltd. Monthly. From Volume 1, No. 1, July, 1958.

Control Engineering. New York, McGraw-Hill Publishing Co. Inc. Monthly. From Volume 2, No. 8, 1955.

Copper Development Association, Radlett, Hertfordshire. Technical Survey. Half-yearly. 1 year.

Cost Accountant. London, Institute of Cost and Works Accountants. Monthly. 1 year.

Cronache della Produttività. Rome, Comitato Nazionale per la Produttività. Fortnightly. 1 year.

Crossley Chronicle. Manchester, Crossley Brothers Ltd. Irregular. 6 issues.

Director, The. London, Institute of Directors. Monthly. 1 year.

Documentation Mécanique. Paris, Centre de Documentation de la Mécanique. Monthly. 1 year.

Doelmatig Bedrijfsbeheer. Alphen aan den Rijn, N. Samson, N.V. Monthly. 1 year.

Drawing Office Announcer. Now Engineering Designer. q.v.

Economist. London, Economist Newspaper Ltd. Weekly. 6 months.

Edgar Allen News. Sheffield, Edgar Allen and Co. Ltd. Monthly. 6 months.

Ecole d'Organisation Scientifique du Travail, Paris. *See* Trait d'Union.

Electrical Journal. London, Benn Brothers Ltd. Weekly. 2 years.

Electrical Manufacturer. London, J. V. Brittain. Bi-monthly. 2 years.

Electrical Review. London, Electrical Review Publications Ltd. Weekly. 5 years.

Electronic Applications Bulletin, for the electronic equipment and set-making industries. Eindhoven, N.V. Philips' Gloeilampenfabrieken. Monthly. 2 years.

Elliott Journal. London, Elliott Brothers (London) Ltd. Half-yearly. 6 months.

Engineer. London, Morgan Brothers (Publishers) Ltd. Weekly. 5 years.

Engineer and Foundryman: official Journal of the Steel and Engineering Industries Federation of South Africa. Johannesburg, Tearle. Monthly. 1 year.

Engineer Apprentice and Engineer Student. London, Trade and Technical Press Ltd. Monthly. 1 year.

Engineering. London Engineering Ltd. Weekly. 5 years.

Engineering Designer, incorporating the Drawing Office Announcer (Organ of the Institution of Engineering Designers). London, F. P. Kennett. Monthly. 1 year.

Engineering Index. New York, Engineering Index Inc. Annual. From 1950.

Engineering Industries Bulletin. London, Engineering Industries Association. Monthly. 1 year.

Engineering Inspection. London, Institution of Engineering Inspection. Quarterly. 1 year.

Engineering Institute of Canada, Montreal. *See* Engineering Journal.

Engineering Journal. Montreal, Engineering Institute of Canada. Monthly. 1 year.

Engineering Materials and Design. Monthly. London, Heywood & Co. From Volume 1, No. 1, October, 1958.

Engineers' Digest. London, Engineers' Digest Ltd. Monthly. 5 years.

English Electric Journal. Stafford, English Electric Co. Ltd. Quarterly. 6 months.

Esso Oilways. London, Esso Petroleum Company Ltd. Irregular. 6 issues.

Etude du Travail: revue mensuelle du Bureau des Temps Elementaires. Paris, Editions d'Organisation. Monthly. 1 year.

Factory Manager, incorporating the Works Manager. London, Production Publications (London) Ltd. Monthly. 1 year.

Factory Management and Maintenance. New York, McGraw-Hill Publishing Co. Inc. Monthly. 5 years.

Fasteners. Cleveland, Ohio, Industrial Fasteners Institute. Irregular. 12 issues.

Fenner, J. H., and Co. Ltd., Hull. *See* V-Belt Journal.

Flow. Cleveland, Ohio, Flow Publishing Co. Monthly. 5 years.

Foundry Trade Journal, with which is incorporated the Iron and Steel Trades Journal. London, Industrial Newspapers Ltd. Weekly. 5 years.

Furniture Development Council, London. Technical Bulletin. Bi-monthly. 1 year.

G.E.C. Journal. London, General Electric Company Ltd. Quarterly. 6 issues.

Government Publications: Consolidated List. London, H.M.S.O. Annual. From 1951.

Grits and Grinds. Worcester, Mass., Norton Company. Irregular. 6 issues.

Haynes Alloys Digest. International Edition. New York, Haynes Stellite Department, Union Carbide International Company. Irregular. 6 issues.

Heating and Air Treatment Engineer. London, Princes Press Ltd. Monthly. 1 year.

Herbert, Alfred, Ltd., Coventry. *See* Machine Tool Review.

Hiduminium Abstract Bulletin. Slough, Buckinghamshire, High Duty Alloys Ltd. Monthly. 1 year.

High Duty Alloys Ltd., Slough, Buckinghamshire. *See* Hiduminium Abstract Bulletin.

Hommes et Techniques. Paris, Hommes et Techniques. Monthly. 1 year.

Hungarian Technical Abstracts. Budapest, National Technical Library. Quarterly. 1 year.

I.A.A.E. Journal. *See* Institution of Automotive and Aeronautical Engineers, Melbourne. Journal.

Incorporated Sales Managers' Association, London. *See* Marketing.

Index Aeronauticus. London, TPA3 Technical Information Bureau for Chief Scientist, Ministry of Supply. Monthly. 1 year.

India Society of Engineers, Calcutta. *See* Science and Engineering.

Indian and Eastern Engineer, incorporating Indian and Eastern Motors. Calcutta, Samar Gupta. 1 year.

Industrial Arts Index. New York, H. W. Wilson Company. Monthly. From 1950.

Industrial Diamond Review, incorporating Bibliography of Industrial Diamond Applications. London, N.A.G. Press Ltd. Monthly. 2 years.

Industrial Equipment News. London, Industrial Equipment News. Monthly. 6 months.

Industrial Fasteners, Institute, Cleveland, Ohio. *See* Fasteners.

Industrial Welfare and Personnel Management. London, Industrial Welfare Society Inc. Bi-monthly. 2 years.

Industrial Welfare Society, London. *See* Industrial Welfare and Personnel Management.

Industrial Management Research Association, London. Confidential Bulletin. Monthly. 6 months.

Informes de la Construcción. Madrid, Instituto Técnico de la Construcción y del Cemento. Monthly. 1 year.

Institute of British Foundrymen, Manchester. Proceedings. Annual. 2 years.

Institute of Cost and Works Accountants, London. *See* Cost Accountant.

Institute of Directors, London. *See* Director, The.

Institute of Industrial Supervisors, Birmingham. *See* The Supervisor.

Institute of Industrial Technicians, Liverpool. *See* Time and Motion Study.

Institute of Marine Engineers, London. Transactions. Monthly. 1 year.

Institute of Materials Handling, London. Journal. Quarterly. From No. 1, May 1958.

Institute of Metal Finishing, incorporating the Electrodepositors' Technical Society, London. Transactions. Irregular. 6 issues.

Institute of Personnel Management, London. *See* Personnel Management.

Institute of Road Transport Engineers, London. Journal and Proceedings. Three issues per annum. 1 year.

Institute of the Motor Industry, London. Journal. Quarterly. 1 year.

Institute of Vitreous Enamellers, Ripley. *See* Sheet Metal Industries.

Institute of Welding, London. British Welding Journal. q.v.

Institution of Automobile Engineers, London. Proceedings. Annual. Vol. 20, 1925-26; Vol. 24, 1929-30; Vol. 27, 1932-33 to Vo. 40, 1945-46. Later issues entered under Institution of Mechanical Engineers - Automobile Division.

Institution of Automotive and Aeronautical Engineers, Melbourne. Journal. Monthly. 1 year.

Institution of Civil Engineers, London. Chartered Civil Engineer. q.v.

Institution of Civil Engineers, London. Proceedings. Monthly. Issued in three parts: Part I, bi-monthly; Parts II and III, each three times per annum. 1 year.

Institution of Electrical Engineers, London. Proceedings. Part I, General. Bi-monthly.

Institution of Engineering Designers, London. *See* Engineering Designer.

Institution of Engineering Inspection, London. *See* Engineering Inspection.

Institution of Engineers and Shipbuilders in Scotland, Glasgow. Transactions. Seven times per annum. 1 year.

Institution of Engineers, Australia, Sydney. Journal. Monthly. 1 year.

Institution of Heating and Ventilating Engineers, London. Journal. Monthly. 1 year.

Institution of Mechanical Engineers, London. Chartered Mechanical Engineer. q.v.

Institution of Mechanical Engineers, London. Proceedings. Annual. From Volume 147, 1942.

Institution of Mechanical Engineers, London. Automobile Division. Proceedings. Annual. From 1947-48.

Institution of Production Engineers, London. Journal. Monthly. From Volume 1, 1921-22.

Institution of Works Managers, London. *See* Works Management.

Instituto Técnico de la Construcción y del Cemento, Madrid. *See* Informes de la Construcción.

Instrument Engineer, Luton, George Kent Ltd. Half-yearly. 6 issues.

International Institution for Production Engineering Research, Paris. *See* Microtecnic.

Irish Engineering Building and Construction. Dublin, Parkside Press Ltd. Monthly. 1 year.

Iron Age. Philadelphia, Chilton Publishing Co. Inc. Monthly. From Volume 167, January, June, 1951.

Iron and Coal Trades Review. London, Industrial Newspapers Ltd. Weekly. (Organ of the National Association of Colliery Managers and the Association of Colliery Managers in India.) From Volume 166, January-June, 1953.

Iron and Steel Institute, London. Journal. Monthly. From Volume 163, September - December, 1949.

Journal of Applied Pneumatics. Richmond, Martonair Limited. Quarterly. 1 year.

Journal of Documentation. London, Aslib. Quarterly. 1 year.

Journal of Industrial Engineering. Atlanta, Georgia, American Institute of Industrial Engineers Inc. Bi-monthly. From Volume 5, 1954.

Junior Institution of Engineers, London. Journal. Monthly. 1 year.

Leeds Association of Engineers, Leeds. Annual Report and Journal. Annual. 1 issue.

Light Metals Bulletin. British Aluminium Co. Ltd., Intelligence Dept. Fortnightly. 1 year.

Lubrication. New York, California Texas Oil Company Ltd. Monthly. 6 months.

Machine and Tool Blue Book. Wheaton, Ill. Hitchcock Publishing Company. Monthly. From Volume 49, 1953.

Machine Design. Cleveland, Penton Publishing Company. Monthly. From Volume 25, 1953.

Machine Shop Magazine. London, Iliffe and Son Ltd. Monthly. 2 years.

Machine-tool Review. Coventry, Alfred Herbert Ltd. Bi-monthly. 2 years.

Machinery (London). London, Machinery Publishing Co. Ltd. Weekly. From Volume 61, July-December, 1942.

Machinery (New York). New York, Industrial Press. From Volume 60, 1953-54.

Machinery Lloyd. European and Overseas Editions. London, Continental and Overseas Organisation Ltd. Weekly. *6 months.*

Machinery Market. London, Machinery Market. Weekly. *6 months.*

Machinist, The. Now Metalworking Production. q.v.

Magnesium Elektron Ltd., Manchester. *See* Magnesium Review and Abstracts.

Magnesium Review and Abstracts. Manchester, Magnesium Elektron Ltd. Irregular. *1 year.*

Management Abstracts. London, British Institute of Management. Monthly. *From Volume 1, 1948.* (From April, 1958, incorporated in The Manager q.v.)

Management Digest. Adelaide, Australian Institute of Management, Adelaide Division. Bi-monthly. *2 years.*

Management News, Sydney, Australian Institute of Management, Sydney Division. Monthly. *2 years.*

Management Review. New York, American Management Association. Monthly. *1 year.*

Manager, The. London, Management Publications Ltd. Monthly. *2 years.* (Incorporates B.I.M. Journal and Management Abstracts q.v.)

Marketing. London, Incorporated Sales Managers Association. Monthly. *1 year.*

Martonair Ltd., Richmond. *See* Journal of Applied Pneumatics.

Mass Production. London, Sawell Publications Ltd. Monthly. *2 years.*

Material Handling Engineering. *See* Modern Materials Handling.

Materials in Design Engineering. New York, Reinhold Publishing Corporation. Monthly. *From Volume 37, January-June, 1953.* Materials and Methods.

Mechanical Engineering. Easton, Pa., American Society of Mechanical Engineers. Monthly. *From Volume 37, 1950.*

Mechanical Handling. London, Iliffe and Son Ltd. Monthly. *From Volume 37, 1950.*

Mechanical World and Engineering Record. Manchester and London, Emmott and Co. Ltd. *2 years.*

Metal Progress. Cleveland, Ohio, American Society for Metals. Monthly. *2 years.*

Metal Treatment and Drop Forging: official organ of the National Association of Drop Forgers and Stampers. London, Industrial Newspapers Ltd. Monthly. *5 years.*

Metalworking. Orange, Conn., Sutton Publishing Company. Monthly. *1 year.*

Metalworking Production, incorporating the Machinist. London, McGraw-Hill Publishing Company Ltd. Weekly. *5 years.*

Metropolitan-Vickers Electrical Co. Ltd., Manchester. Research Dept. Technical News Bulletin. Weekly. *1 year.*

Microtecnic: international review for production engineering research, scientific and industrial metrology, inspection and optics. Official bulletin of the International Institution ... Production Engineering Research. Lausanne, Scriptar Ltd. Bi-monthly. *2 years.*

Mill and Factory. New York, Conover-Mast Publications Inc. Monthly. *From Volume 58, No. 1, 1956.*

Ministry of Supply — Technical Information Bureau. *See* Index Aeronauticus.

Modern Machine Shop. Cincinnati, Gardner Publications Inc. Monthly. *2 years.*

Modern Materials Handling. (Including Materials Handling Engineering, official publication of the American Material Handling Society Inc.) Boston, Mass., Materials Handling Laboratories Inc. Monthly. *5 years.*

Mond Nickel Company Ltd., London. *See* Nickel Bulletin.

Monthly Digest of Statistics; prepared by the Central Statistical Office. London, H.M.S.O. Monthly. *1 year.*

M.O.R. Group of Companies. *See* Oil.

Murex Review. Rainham, Essex, Murex Ltd. Irregular. *6 issues.*

National Research Development Corporation, London. *See* NRDC Bulletin.

National Association of Colliery Managers. *See* Iron and Coal Trades Review.

National Association of Drop Forgers and Stampers, Birmingham. *See* Metal Treatment and Drop Forging.

National Institute of Industrial Psychology, London. *See* Occupational Psychology.

National Technical Library, Budapest. *See* Hungarian Technical Abstracts.

Nederlands Instituut voor Documentatie en Registratuur, The Hague. *See* Tijdschrift voor Efficiëntie en Documentatie.

New Zealand Engineering: Journal of the New Zealand Institution of Engineers. Wellington, Technical Publications Ltd. Monthly. *1 year.*

New Zealand Institution of Engineers, Wellington. *See* New Zealand Engineering.

Nickel Bulletin. London, Mond Nickel Company Ltd. Monthly. *1 year.*

North East Coast Institution of Engineers and Shipbuilders, Newcastle upon Tyne. Transactions. Eight issues per annum. *1 year.*

Norton Company, Worcester, Mass., *See* Grits and Grinds.

NRDC Bulletin: a quarterly review of inventions available for introduction to industry. London, National Research Development Corporation. Quarterly. *1 year.*

O.R.: Operational Research Quarterly. London, Operational Research Society. *From Volume 1, 1950.*

Occupational Psychology. London, National Institute of Industrial Psychology. Quarterly. *2 years.*

Office Management: the Journal of the Office Management Association. Monthly. *1 year.*

Oil. London, M.O.R. Group of Companies. Quarterly. *1 year.*

Oil Lifestream of Progress. New York, California Texas Oil Company Ltd. Quarterly. *1 year.*

Operational Research Society, London. *See* O.R.: Operational Research. Quarterly.

Operations Society of America, Baltimore, Maryland. Journal. Quarterly. *From Volume 2, 1954.*

Patronato Juan de la Cierva de Investigación Técnica, Madrid. *See* Revista de Ciencia Aplicada.

Pera Bulletin. Melton Mowbray, Production Engineering Research Association of Great Britain. Monthly. *From Volume 1, 1947-48.*

Personnel Management. London, Institute of Personnel Management. Quarterly. *1 year.*

Personnel Management Welfare and Industrial Equipment. London, Shaw Publishing Company Ltd. Monthly. *1 year.*

Philips, N.V. Gloelampenfabriken, Eindhoven, *See* Electronic Applications Bulletin; Philips Serving Science and Industry; Philips Technical Review.

Philips Serving Science and Industry. Eindhoven, N.V. Philips Gloelampenfabriken. Bi-monthly. *1 year.*

Philips Technical Review. Eindhoven, N.V. Philips Gloelampenfabriken. Monthly. *1 year.*

Polish Technical Abstracts. Warsaw, Centralny Instytut Dokumentacji Naukowo-Technicznej. Quarterly. *1 year.*

Power Transmission. London, Trade and Technical Press. Monthly. *2 years.*

Precision Metal Molding. Cleveland, Technical Publishing Company Ltd. Monthly. *2 years.*

Process Control and Automation. London, Colliery Guardian Co. Ltd. Monthly. *From January, 1955.*

Product Engineering. New York, McGraw-Hill Publishing Company Inc. Weekly. *5 years.*

Product Finishing. London, Sawell Publications Ltd. Monthly. *5 years.*

Production Engineering Research Association of Great Britain, Melton Mowbray. *See Pera Bulletin.*

Produttività. Rome Comitato Nazionale per la Produttività. Monthly. *1 year.*

Refa Nachrichten: zeitschrift für Arbeitsstudien. Darmstadt, Hrsg. vom Verband für Arbeitsstudien. Quarterly. *5 years.*

Revista de Ciencia Aplicada. Madrid, Patronato Juan de la Cierva de Investigación Técnica. Bi-monthly. *1 year.*

Revue Générale des Sciences Appliquées: bulletin technique des Ingénieurs sortis de l'Université Libre de Bruxelles. Bi-monthly. *1 year.*

Reynolds Metals Technical Advisor. Louisville Kentucky, Reynolds Metals Company. Irregular. *6 issues.*

Rivista di Meccanica. Milan, Associazione Meccanica Italiana. Fortnightly. *1 year.*

Rotol and British Messier Digest. Gloucester, Rotol Ltd., and British Messier Ltd. Monthly. *6 months.*

Royal Aeronautical Society, London. Journal. Monthly. *1 year.*

Rubber Developments. London, British Rubber Development Board. Quarterly. *1 year.*

Science and Engineering. Calcutta, India, Society of Engineers. Bi-monthly. *1 year.*

Scientific Lubrication. Broseley, Shropshire, Scientific Publications. Monthly. *2 years.*

Screw Machine Engineering. Rochester, New York, Screw Machine Publishing Company Inc. Monthly. *2 years.*

Sheet and Strip Metal Users' Association, London. *See Sheet Metal Industries.*

Sheet Metal Industries, incorporating Metal Finishing: the official organ of the Institute of Vitreous Enamellers; Sheet and Strip Metal Users' Association; Sheet Metal Industries Association; Cold Rolled Sections Association; Cold Rolled Steel Strip Association. London, Industrial Newspapers Ltd. *From Volume 28, 1950.*

Sheet Metal Industries Association Ltd., London. *See Sheet Metal Industries.*

Shell Magazine. London, Shell Group of Companies. Monthly. *6 months.*

Silentbloc Ltd., London. *See Torque.*

Society of Industrial Engineers, London. *See Work Study and Industrial Engineering.*

South Wales Institute of Engineers, Cardiff. Proceedings. Three times per annum. *1 year.*

The Supervisor. Birmingham, Institute of Industrial Supervisors. Monthly. *1 year.*

Swiss Association of Machinery Manufacturers, Zurich. *See Swiss Technics.*

Swiss Technics. Lausanne, Swiss Office for the Development of Trade, in co-operation with the Swiss Association of Machinery Manufacturers, Lausanne. Three times per annum. *1 year.*

Tabulator, The. London, British Tabulating Machine Company Ltd. Irregular. *6 issues.*

Technology. London, the Times. Monthly. *From Volume 1, No. 1, 1957.*

Textile Institute, Manchester. Journal. Monthly. *From Volume 45, 1954.*

Tijdschrift voor Efficientie en Documentatie: organ van het Nederlands Instituut voor Efficientie het Nederlands Instituut voor Documentatie en Registratuur, en van de Nederlandse Vereniging van Bedrijfsarchivarissen. The Hague, Nederlands Instituut voor Efficientie. Monthly. *1 year.*

Time and Motion Study: Journal of the Institute of Industrial Technicians. London, Sawell Publications Ltd. Monthly. *From Volume 1, October - December, 1952.*

Times Review of Industry. London, the Times. Monthly. *2 years.*

Timken Times and FDC Bulletin. Northampton, British Timken Ltd. Monthly. *1 year.*

Tool Engineer. Milwaukee, Wisconsin. American Society of Tool Engineers. *From Volume 23, July - December, 1949.*

Torque. London, Silentbloc Ltd., and the Andre Rubber Company. Quarterly. *1 year.*

Trait d'Union: Bulletin mensuel de l'Amicale des Anciens Eleves de l'Ecole l'Organisation Scientifique du Travail. Paris, Sonneville. Monthly. *1 year.*

Union Carbide International Company, New York. *See Haynes Alloys Digest.*

V-Belt Journal. Hull, J. H. Fenner and Co. Ltd. Quarterly. *1 year.*

Verband für Arbeitsstudien, E.V. *See Refa Nachrichten.*

Warsaw — Centralny Instytut Dokumentacji Naukowo-Technicznej. *See Polish Technical Abstracts.*

Welding and Metal Fabrication. London, Iliffe and Son Ltd. Monthly. *2 years.*

Werkstatt und Betrieb. Munich, Carl Hanser Verlag. Monthly. *2 years.*

Werkstatttechnik und Maschinenbau: organ der Arbeitsgemeinschaft deutscher Betriebsingenieure und Arbeitsgemeinschaft für fertigungstechnisches Messwesen im VDI. Berlin, Carl Springer Verlag. Monthly. *1 year.*

Whittakers Cumulative Book List. London, J. Whittaker and Sons Ltd. Quarterly. *From 1951.*

Wiggin Nickel Alloys. Birmingham, Henry Wiggin and Co. Ltd. Irregular. *6 issues.*

Woman Engineer. London, Women's Engineering Society. Quarterly. *1 year.*

Work Study and Industrial Engineering. London, Management Publications Ltd., for the Work Study Society and the Society of Industrial Engineers. Monthly. *From Volume 1, No. 1, January, 1957.* (As the Work Study Journal, official publication of the Work Study Society. *From Volume 2, No. 8, March, 1952.*

Work Study Society, Manchester. *See Work Study and Industrial Engineering.*

Works Management: official organ of the Institution of Works Managers. London, Drury Press Ltd. Monthly. *1 year.*

Z.D.A. Abstracts. Oxford, Zinc Development Association. Monthly. *1 year.*

Zinc Bulletin. Oxford, Zinc Development Association. Irregular. *12 issues.*

Zinc Development Association, Oxford. *See Z.D.A. Abstracts.*

## NOTICE OF ANNUAL GENERAL MEETING

NOTICE is hereby given that the Annual General Meeting of the Institution will be held at 10 Chesterfield Street, Mayfair, London, W.1, on Thursday, 29th January, 1959, at 2 p.m.

### AGENDA

1. Notice convening Meeting.
2. Minutes of the Extraordinary General Meeting held on 30th January, 1958.
3. Minutes of the Annual General Meeting held on 30th January, 1958.
4. Report on Election of Members to Council 1.
5. Annual Report of Council 2.
6. Presentation of Statement on Income and Expenditure, Balance Sheet and Auditors' Report 3.
7. To consider a motion: that the Institution should petition Her Majesty The Queen for a grant of a Royal Charter of Incorporation, and that the Council be empowered to take all necessary action.
8. Election of Auditors, 1958 - 1959.
9. Election of Solicitors, 1958 - 1959.
10. Votes of Thanks.

By Order of the Council.

W. F. S. WOODFORD, *Secretary.*

1. See page 41.

2. See page 42.

3. See page 49.

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## MINUTES OF EXTRAORDINARY GENERAL MEETING

**held on Thursday, 30th January, 1958**

AN Extraordinary General Meeting of the Institution was held at 10 Chesterfield Street, Mayfair, London, W.1, on Thursday, 30th January, 1958, at 2 p.m. Mr. G. R. Pryor, Vice-President, was in the Chair.

The SECRETARY (Mr. W. F. S. Woodford) read the Notice convening the Meeting.

Mr. H. G. GREGORY (Chairman of Council) moved the adoption of the Special Resolution that Article of Association 15 be amended as follows, viz: - In paragraph (c) the word "may" where it appears for the second time be deleted and the word "shall" be substituted therefore. This part of Article 15 as amended to read as follows: -

(c) Have passed the Associate Membership Examination prescribed by the Council's examination regulations for the time being, or such other exempting examinations as may from time to time be approved by Council; provided that candidates over the age of 35 who have not passed one of the above-mentioned examinations shall be required to pass only such part or parts of the Associate Membership Examination or to submit such Theses as the Council shall direct.

Mr. H. W. BOWEN (Vice-Chairman of Council) seconded the motion which was *carried* unanimously.

*This concluded the business of the Extraordinary General Meeting.*

# MINUTES OF THE ANNUAL GENERAL MEETING

held on Thursday, 30th January, 1958

THE Annual General Meeting of the Institution was held at 10 Chesterfield Street, London, W.1, on Thursday, 30th January, 1958, at 2.05 p.m. Mr. G. R. Pryor, Vice-President, was in the Chair.

## Notice convening Meeting

The Secretary (Mr. W. F. S. Woodford) read the Notice convening the meeting.

## Minutes

The Minutes of the Annual General Meeting held on 31st January, 1957, were taken as read and were confirmed on the motion of Mr. H. Stafford, seconded by Mr. F. J. Everest, and were signed as correct.

## Report on Election of Members to Council

The Report on the Election of Members to Council was received on the motion of Mr. L. Shenton, seconded by Mr. F. T. Dyer.

## Annual Report of Council

Mr. H. G. Gregory (Chairman of Council) referred to the printed version of the Report which was published in full in the January 1958 Journal, pages 62-68. Members would not, he said, expect him to read this report but they might like him to refer to one or two points.

One of the most important decisions in the history of the Institution had been made that day in the Council meeting; namely, the adoption of a completely revised examination structure. Mr. France would talk about this later at a continuation of the Council meeting.

Details of the changes in the examination would be made public in the immediate future, and the new examination would take effect as from the examination to be sat in 1960. The Education Committee had been working on this new structure for four years, and the purpose of revising the examination was to enable the education requirements to be in step with the Institution's policy of broadening the base of membership. Production Engineering was slowly emerging as a recognised technology in its own right. The Education Committee had incorporated in the examination provision for the most recent developments in production technology and management, in the hope that it would stimulate universities and technical colleges and other places of learning to offer courses in the most advanced technologies.

Another decision which the Council had taken that day was really relevant to the report to next year's Annual General Meeting. But it was of such importance that he was prompted to mention it:

the inauguration of three new awards to commemorate the names of three of the Institution's most distinguished Past Presidents. The Council had decided to establish an E. W. Hancock Paper. Mr. Hancock had given his service to the Institution since its inception, and as long ago as 1931 he served as Chairman of Council. He had always spoken strongly in favour of the development of human relations in industry. It was fitting that the E. W. Hancock Paper should be devoted at each presentation to some aspect of human relations in industry.

The second award was to be known as the Sir Walter Puckey Prize. This would be an annual prize of £50 to be awarded to the student showing the most outstanding performance in the Diploma of Technology or in post-Diploma work. The question was asked whether it was an open award at the Council that morning, and the Council confirmed that it was. Sir Walter Puckey was Chairman of the Board of Engineering Studies of the National Council for Technological Awards, and the work of the Board under his chairmanship was having an immense effect on the colleges of advanced technology.

The third award would be known as the J. D. Scaife Award and would be in the form of a medal awarded annually for the best paper published in the Institution's Journal each year (with the exception of the Named Papers). Mr. Scaife was one of the original founder members of the Institution. He had the unique distinction of having been a member of the Council in one capacity or another ever since the Institution was founded. In the very early days of the Institution Mr. Scaife pressed hard for the Institution to extend its influence over a wide range of industry. In those days his views were considered too advanced, and it was only in quite recent times that they had come to realise that his vision of the future had been proved to be true.

Mr. Gregory was sure that every member of the Institution would support the Council's action in thus making permanent recognition of the service not only to the Institution, but to the profession of production engineering generally, which these three distinguished Past Presidents had given.

In presenting the report, he did not propose to expand upon the financial position, since this was provided for separately on the Agenda. He would like to say, however, at this point, that the increases in postal and telephone charges as introduced in the current financial year had been a serious blow to the Institution. In asking members to accept a modest increase in the annual subscription last year, the Council hoped that they had made adequate

provision for some years to come. The past twelve months had seen the greater part of the increased income taken away by the increase in postal and telephone charges. A large proportion was the cost of sending the Journal to members, a service no one would wish to curtail.

Members could adopt the report knowing that the Council was in full support, and he had pleasure in moving its adoption.

Mr. E. F. Gilberthorpe seconded the motion.

There being no questions or comments, the motion for the adoption of the Report was put to the meeting and was carried unanimously.

#### **Statement on Income and Expenditure, Balance Sheet and Auditors' Report**

Mr. H. G. Gregory (Chairman of Council), seconded by Mr. C. B. Abbey, moved the adoption of the accounts.

Mr. R. W. Hancock asked whether the item on page 70—Recovery of Income Tax on Subscriptions—referred to sums it was hoped to recover under covenanting.

Did it mean there had been no effective return from that?

The Secretary replied that for several years just over £2,000 had been recovered, and last year the figure was £2,283. This was not taken into account until the money was actually received. It was not shown as outstanding, because there was always the possibility of the Revenue authorities changing their minds. They had challenged the Institution this year not because the claim was in doubt, but because another Institution of a similar nature had been challenged.

Mr. Hancock wondered whether the time might be ripe to press for more members to covenant.

The Chairman said it might be prudent to await the Court's decision. Although it would be a good thing if more members would sign covenants, it must be remembered that where a member's subscription was allowed as an expense, this would not apply.

The motion was put to the meeting and was carried.

#### **Election of Auditors, 1957-1958**

On the motion of Mr. A. Betts Brown, seconded by Mr. K. J. Hume, Messrs. Gibson, Appleby & Co., Chartered Accountants, were re-elected Auditors to the Institution for the year 1957-1958 and were thanked for their previous services.

#### **Election of Solicitors, 1957-1958**

On the motion of Mr. J. France, seconded by Mr. F. G. S. English, Messrs. Syrett & Sons were appointed Solicitors to the Institution for the year 1957-1958 and were thanked for their previous services.

#### **Votes of Thanks**

The Chairman said it remained for him to move a vote of thanks, first to Mr. E. W. Hancock, M.B.E., the immediate Past President. Everyone knew of the wonderful job he had done for the Institution in spite of disability following a serious operation not long before. It was a matter for gratification that for ever more now there was to be a Named Paper for him in commemoration of his work for the Institution.

Mr. Pryor also moved a vote of thanks to the Chairman of Council, Mr. H. G. Gregory, who had been most assiduous in his duties, and had been a great help to every one concerned. The Council were very fortunate to have him in the Chair.

Next, he would like to thank Mr. H. W. Bowen, Vice-Chairman of Council, particularly for his difficult work as liaison officer with the overseas Sections.

There was a great deal of talent in the Institution, and its strength was in those people who gave their time and work to it. Members were most grateful to them. He was very conscious that he had not done full justice in moving a vote of thanks to them, but it had been hoped that Lord Halsbury, the President of the Institution, would have taken the Chair. However, he was very happy to move this vote of thanks, in all sincerity.

*The vote of thanks was carried by acclamation.*

Mr. H. G. Gregory (Chairman of Council) said he greatly appreciated the Vice-President's remarks and felt sure Mr. Bowen would support him. Anything he had done for the Institution was without any thought of personal gain.

He thanked the Headquarters staff for the help they had given him personally, and particularly Mr. Woodford for the way in which he conducted the affairs of the Institution. The team Mr. Woodford headed was doing a first-class job.

The Chairman said he would like, from the Chair, to take the opportunity of putting on record that the Institution as a corporate body was most grateful to all who worked voluntarily for it—Region and Section Officers and members of their Committees, and Chairmen and Members of Standing Committees. Their work added up to a very great amount of effort and was the strength of the Institution.

Mr. R. E. Leakey moved a vote of thanks to the Chairman for the way in which he had conducted the meeting and for his indefatigable work for the Institution. This was another example of his help and guidance.

Mr. Jackman seconded the motion and thanked the Chairman for his courtesy and efficiency.

*The vote of thanks was carried unanimously.*

The Chairman thanked the meeting and declared it closed.

# REPORT ON ELECTION OF MEMBERS TO COUNCIL

## 1958 - 1959

**I**N accordance with Article of Association No. 34, there were 10 vacancies for elected Members of Council (nine Members and one Associate Member).

For the nine vacancies for elected Members 19 nominations were received. As a result of the ballot conducted in accordance with Article of Association No. 43, the following were elected :-

Mr. H. Bainbridge	Mr. B. C. Harrison
Mr. G. R. Blakely	Mr. E. Levesley
Mr. J. V. Connolly	Mr. R. N. Marland
M. E. P. Edwards	Dr. T. U. Matthew
Mr. P. H. W. Everitt	

For the one vacancy for the elected Associate Member, four nominations were received. The Associate Member elected was :-

Mr. R. J. C. Whitaker

Ballot Papers were circulated to 5,875 Corporate Members in the United Kingdom. Details of the voting issued by the Institution's Auditors are as follows :-

Eligible papers included in the ballot	1,164
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Rejected :

Incorrect number of votes	...	13
Papers not marked in ink	...	11
Spoiled papers	...	10
Envelopes unsealed	...	2
Insufficiently stamped — not accepted	...	12
Received from G.P.O.—addressees not traced	...	4
Papers received after closing date	100	
Correspondence received with Ballot Paper	...	1
	—	153
	—	1,317

The full list of Council Members for the current year is published in the Journal.

## REPORT OF COUNCIL

**1st July, 1957 to 30th June, 1958**

**to be presented by the Chairman of Council  
at the Annual General Meeting, Thursday, 29th January, 1959**

IT is with great pleasure that I place before you this report of your Council's work for the past year, and of our Standing Committees and other activities.

During the year under review, Mr. Harry Gregory was Chairman of Council and it was a great personal pleasure for me to serve under Mr. Gregory as Vice-Chairman. I know I shall be expressing the thoughts of all my colleagues on the Council and on the Finance and General Purposes Committee, when I say how much we enjoyed working under his Chairmanship and how much we appreciated his firm and able leadership of our discussions.

Your Council has met four times during the year. They had much routine work to deal with, but they have also found time to have discussions on important matters of Institution policy. Subjects which have been debated at length during the year have been:—The Institution's Future Conference Policy; Financial Policy; New Associate Membership Examination and Membership Policy.

Your Council has decided that in future the Institution shall not arrange bi-annual, residential conferences on a national scale as a matter of routine and habit. There has been an excess of conferences since the War and it is noticeable that the attendance at many conferences is declining. Your Council feels that there is no virtue in holding a conference for its own sake and we have decided that our national conferences will in future be convened only on those occasions when a subject of national or international importance becomes current and is worthy of a high level conference, spread over several days.

However, your Council recognises that there must be provision for members to gather together to discuss common problems and we shall encourage our Regional organisation to have more Regional conferences of shorter duration, which will enable our members to gather together and discuss their problems with the minimum loss of time. I am sure that you will all agree with me that this is a much more sensible approach.

The Institution's Financial Policy has absorbed a good deal of our time. The further substantial increase in postal and telephone charges and the consequent effect on other expenses has dealt a serious blow to our finances. You will see from an examination of the accounts published on page 50 a surplus of income over expenditure for the year of £3,047, as compared with £8,530 for the previous year, and this in spite of the fact that our income was slightly more. The increased postal charges bear most heavily on our Journal and it reflects great credit on our Editorial Committee and staff that they have continued to produce such an excellent Journal.

I do suggest that our reduced surplus is entirely due to increased postal and telephone charges and their side effects. Part of our additional expenditure is represented in the appointment of our Education Officer, Mr. Cooper, and his assistant, Mr. King. These two, very competent officers, have added considerably to our strength at Headquarters and the fact that their services are in constant demand, involving them in considerable travel throughout the country, indicates that they are fulfilling a very obvious need.

As Mr. Gregory told you last year, it is the view of your Council and Finance and General Purposes Committee that the Institution should budget for an annual surplus of approximately 10% of income, in order to provide an accumulation of funds for the future expansion of the Institution. When our membership subscriptions were increased on 1st July, 1956, we hoped that this would provide us with our 10% surplus and indeed, the figure of £8,530 last year indicated that we were moving in the right direction. It is quite plain, however, that a surplus of £3,000 is not adequate to provide for the future. How to maintain a surplus of 10% and to continue the high level of the Institution's activities and services to the membership, is a problem which has exercised your Council and Finance and General Purposes Committee throughout the year. It would

be a retrograde step to decrease our expenditure by reducing Institution activities and services. On the contrary, we must continue to expand the immediate usefulness of the Institution as well as making adequate provision for the future; our income must, therefore, be increased. This can come partly from an increase in the number of our members; and we have made steady progress over the years. For the last year or two, however, there has been a pause in the growth of our membership, partly—indeed I think one may say almost wholly—due to the high standard of membership qualifications which we have set. I am sure this is the right policy. A professional institution whose membership has a high standard of qualification will inevitably attract more members of the same calibre. Nevertheless, we must face the fact that to produce an annual surplus of income over expenditure of the order that we have in mind, would involve a very substantial increase in the membership, a condition which we do not foresee in the immediate future. We may, therefore, be compelled to face a further increase in our membership subscriptions and this is a matter which your Council is currently considering.

An examination of the published accounts indicates that we are still being subjected to inflationary pressures. You will see, for example, that our establishment charges show an increase over the previous year, although our establishment is no bigger. But during the year, we have had to accept an increase in our rates, increase in the cost of cleaning and an increase in the cost of fuel oil. Our administration charges are also slightly higher. There are several reasons for this: firstly, we undertook a substantial amount of additional printing in order to prepare literature to launch our new examination, which takes effect in 1960; I have already mentioned the increased costs of postage and telephone and the travelling activities of our senior staff; salaries show an increase over the previous year. This is due partly to the increased strength of our staff and also to general increase in the level of salaries and wages. The Finance and General Purposes Committee considers that the level of our salaries is generally adequate although, in some grades, we must recognise that it is extremely difficult to compete with the very high rates offered by commerce and industry.

The various other items of expenditure listed in the accounts are self-explanatory, but you will see that, all in all, the total expenditure adds up to substantially more than last year. As I have already mentioned, our income is also higher, but not to the same extent. It is gratifying to see that our income from subscriptions continues to grow and I hope it will continue to do so indefinitely. We have been very much helped, over the past few years, by those members who have signed covenants to pay their subscriptions for seven years and we have been able to recover income tax on these covenants. So far, we have recovered from the revenue £8,293. We do not regard this as income, but rather as a capital accretion. Unfortunately, the Inland Revenue has challenged our right to reclaim this tax and they declined to

refund the tax for last year and the current year. We have appealed against their decision. However, following the Chancellor of the Exchequer's announcement in the Budget this year that subscriptions to professional institutions in approved cases would be allowed as an expense, we shall not invite any more members to sign deeds of covenant, since they will now be able to deduct their subscriptions from income before their tax is calculated.

The adoption of the accounts is a subject of a special item on the Agenda, and you will then have an opportunity to ask any questions or to make any comment.

#### **Production Exhibition and Conference**

The Production Exhibition and Conference, which was opened by Lord Mills, Minister of Power, was held at Olympia from 12th May to 21st May, 1958. Concurrently with the Exhibition, the Institution promoted a Conference with the theme "Production Fights Inflation". The Papers presented at this Conference were of a very high order and it was regrettable that the attendance at some of the sessions was not as high as had been hoped.

Your Council feels that the Institution, having sponsored the Production Exhibition for its first three presentations, has gone as far as a professional institution ought to do in this connection and has decided to discontinue the sponsorship in future.

#### **Regional and Sectional Activities**

There are now within the U.K. Regional Organisation, 38 Senior Sections, 13 Graduate Sections and 1 Student Section. Outside the U.K. there are Councils in Australia and South Africa and Sections in New Zealand, India and Canada. The Regions and Sections have been very active during the year. In the U.K. some 350 meetings have been held, also a number of interesting works visits. In addition, many enjoyable social functions have been arranged. It is pleasing to record that the number of Regional events held show a considerable increase over the previous year. It would take too long to mention all of these in detail, but among the more important were:

The Annual Aircraft Production Conference held in Southampton in January, 1958.

The Conference on "Compressed Air in Industry" at Camborne in April, 1958.

The Midlands Region Conference dealing with "Machining—Tomorrow's Production" in May, 1958.

The North Midlands Region Conference "Foreign Competition—The Challenge" in June, 1958.

The Welsh Region Conference on "What New Skills does the Future demand?" in April, 1958.

Our Councils and Sections outside the U.K. have held more than 50 regular meetings. The largest concentration of members outside the U.K. is in Australia, where there are Sections in Sydney, Melbourne and Adelaide; our Australian members could not be more enthusiastic in the Institution's work and I know their activities have done much to enhance the prestige of the Institution.

Other Sections in the British Commonwealth continue to flourish, but I am aware that certain of these have local problems which are hard to overcome; nevertheless, their devotion to the Institution's work and to the profession is in no way diminished as a result of these difficulties.

It is in our local Sections all over the world that the strength of the Institution lies, and it is through local organisations that our members can most readily maintain their contact with the Institution.

The Annual Conference of Region and Section Honorary Secretaries was held at Head Office on 29th May, 1958. This Conference, at which valuable discussions take place on the administrative problems of the Institution, is a very great help in maintaining the good relations which exist between Honorary Secretaries and the Institution's Head Office staff.

### Visitors

The usual steady stream of visitors, including many from abroad, has continued at Headquarters, where the staff are always pleased to provide assistance and to advise in any way they can. Almost every section of the membership has been represented by our visitors during the year, and personal contacts and friendships which are made in this way go far in maintaining good relations with our members all over the world.

### Standing Committees

Although your Council is responsible for the government of the Institution, the day-to-day administration is much more the concern of our Standing Committees. We have a Standing Committee for each of our main branches of endeavour, with a Finance and General Purposes Committee serving as a kind of Inner Cabinet, the Chairman of each of the other Standing Committees being a member of the F. & G. P. Committee. I should like, therefore, to give you some account of their activities during the past year.

### Education Committee

Throughout the year, the Education Committee has been very much preoccupied with the redrafting of the examination requirements. The new structure and syllabuses for the new Associate Membership examination, to take effect in 1960, have been completed and the following publications have been issued to Principals of Technical Colleges and to many Training Officers in Industry. They are also available on application to the Education Officer.

1. Subjects & Syllabuses for the 1960 A.M. Examination (January, 1958).
2. Notes for Guidance for the 1960 A.M. Examination (March, 1958).
3. Specimen Examination Papers for the 1960 A.M. Examination (April, 1958).
4. Memos EM.62/E (June, 1958) and EM.62/H (October, 1958) on National Certificate Schemes in Production Engineering.

Although work on exemptions to be granted against the 1960 Examination is still proceeding, and will naturally continue to do so, the main exemptions have been decided and are given in leaflet "1960 A.M. Examination Exemptions (October 1958)". This leaflet has been issued to Principals of Colleges and is also available on application. Whilst the leaflet largely covers exemptions against the examination requirements for "junior" membership, it carries an Appendix giving qualifications accepted in lieu, from candidates for corporate membership who hold, or have held, adequate management status on the Production side of industry and have had appropriate Practical Training.

A "List of Text Books of Production Engineering recommended for the 1960 A.M. Examination" is now available.

*Higher Technological Education*—The educational requirements of the new A.M. Examination raise many problems for the "evening only" student or the "part time day release" student. The Education Committee's support for sandwich release schemes for H.N. Diplomas in Technology for suitable students above the age of 18 years, is clearly stated in the memoranda referred to. The number of Diplomas in Technology for Production Engineering Courses now carrying complete exemption is four, and the H.N. Diploma at Gateshead carries similar exemption. The number of H.N. Certificates in Production Engineering awarded for the 1957/58 session is not yet available, but the previous session showed a welcome increase of 20%.

Details have been received from the University of Durham of a first degree honours course with Production Engineering content, and the University of Birmingham launched, in September, a twelve months' post-graduate course in Operational Research.

There is evidence that the educational world is becoming much more aware of the importance of production engineering as a technology and as a discipline capable of being taught at the highest level. Progress is deplorably slow, but the trend is undoubtedly in the right direction.

The announcement of our new examination plans has created a very busy time for our Education Officer and his assistant. Visits have been made to local Sections, to Universities, to Technical Colleges and to many factories to explain the full implications of the new examination scheme and the exemptions.

With some notable exceptions, Colleges are usually prepared to provide courses in Production Engineering, but the minimum number of students laid down by the Ministry of Education must be met and this calls for the closest co-operation from industry. It is rather surprising that many firms with flourishing Production Engineering Departments do not insist that their apprentices take production engineering courses at the Technical College.

Mr. I. B. King, Grad.I.Mech.E., Grad.I.Prod.E., was appointed, on 1st September, 1957, as Assistant Education and Technical Officer and his activities have been largely concerned with the Technical Committees of the Institution. Various technical surveys have been carried out on behalf of the Standards and Research Committees and their sub-committees and also for the Materials Handling Group. Mr. King's qualifications and industrial experience have well fitted him for these duties and enabled him to relieve Mr. Cooper, the Education Officer, of a good deal of routine work.

*The Summer School*—The Summer School was again held at Ashorne Hill and the theme was "The Advancing Frontiers of Production Engineering". The School was devoted mainly to studying the management "tool" subjects now listed in Part II Group C of the Institution's new examination scheme. These subjects are, at the moment, entirely optional but your Education Committee foresees that they are becoming of ever increasing importance.

The Chairman of the Education Committee during the year was Mr. J. France.

*Education Discussion Groups*—The Institution's two Education Discussion Groups, London and the Midlands, have been active during the year, and have discussed a number of widely varying subjects within their field.

In London, the main discussion topic for the year was "The Use of Visual Aids in Teaching Production Engineering", and outside activities included a study of the Apprentice Training Scheme at Vickers-Armstrongs Ltd., Weybridge, and visits to The Glacier Metal Company, The College of Technology at Oxford, and The Industrial Health and Safety Centre.

The discussion meetings of the London Group are usually held on Saturday mornings at Institution Headquarters.

The Midlands Group has held five meetings during the year, and have heard lectures on "Teaching of Metallurgy to Production Engineers"; on the work of the Production Engineering Department of the University of Birmingham; and on "Operational Research". The lectures were held at the Birmingham Exchange and Engineering Centre.

The Group also arranged their customary summer meeting, this year at The English Electric Company's works at Stafford, where the scheme of training for apprentices was explained, the works school and the apprentice hostel were visited, and at different points

on the tour valuable talks were given by key personnel.

#### ***The Membership Committee***

The Membership Committee has been dividing its time between the very large number of applications for membership which they have to consider, and in examining in detail the Institution's membership qualifications policy. Particular attention is being paid to Practical Training requirements and a publication dealing with this will be issued soon. Miss K. Allan, the Registrar, has visited a number of Section Committees for discussion of membership procedures.

There has been some criticism that the Institution's requirements for new members are too strictly enforced, but your Membership Committee is convinced that this is the proper policy to pursue and that this is the only way to establish beyond doubt the Institution's reputation as a leading professional body. The Institution is now the fourth largest engineering institution.

The Committee had altogether a total of 1,333 applications for membership before them and of these 967 were eventually elected to membership. In addition, some 234 applications have been referred back for further examination requirement. The total membership of the Institution at 30th June, 1958, is shown to be as follows:

	June 1958	June 1957
Honorary Members	7	6
Members	1,719	1,708
Associate Members	5,212	5,037
Associates	144	146
Graduates	2,145	2,248
Students	886	1,131
Affiliated Firms	259	244
	10,372	10,520

The Chairman of the Membership Committee during the year was Mr. K. J. Hume.

#### ***The Hazleton Memorial Library***

The large number of enquiries received during the year indicates the wide and widening interests of members of the Institution. Indeed, the extent of the enquiries is making it difficult for our Library Committee and staff to provide an adequate enquiry service within the limits imposed by the building and the finance available. Co-operation with research organisations, specialised information bureaux and with other libraries, either by private arrangement or through the national scheme, does, however, go a long way towards solving the difficulty.

It can truly be said that our Library is part of a great national system, since the Librarian is in continuous contact with other libraries throughout the country. Other libraries, too, are beginning to realise the value of the Institution's Library.

About 4,000 members made use of the Library during the year, either to borrow books and periodicals, or otherwise to obtain information. About 5,000 individual enquiries were dealt with and 4,300 books and periodicals were lent to members and other libraries. I am sure that you will agree that for such a small library, this is a very high level of service to maintain, and reflects great credit on the library staff. The Chairman of the Library Committee during the year was Mr. H. L. Madeley.

#### **Research Committee**

The Research Committee and the Sub-Committees have been extremely active during the year.

The Materials Utilisation Sub-Committee, under the Chairmanship of Mr. R. N. Marland, has completed a collection of case studies and its report is now in the hands of the printers. It is hoped that publication will be early in 1960.

“Quality—Its Creation and Control” is the title of the very interesting report prepared by the Control of Quality Committee under the Chairmanship of Mr. R. K. Grunau. This was published in July, 1958. A Conference on Quality in Industry is now being planned.

Two new subjects are being investigated and Sub-Committees will shortly be formed to consider “Co-ordination of Production Management Techniques” and “Electronics and Kindred Modern Developments as Applied to Process Loading.”

Mr. F. G. S. English was Chairman of the Research Committee during the year. Mr. English has long been connected with the work of the Research Committee and his valuable contribution was very much appreciated. He has now completed his period of office and Mr. B. G. L. Jackman has been elected in his place.

#### **Materials Handling Group**

The Materials Handling Group has continued its work of furthering activities on Materials Handling and is also circulating to Section Representatives extracts from articles on Materials Handling taken from nearly 1,000 Technical Journals from all countries of the world. A three-day Convention was held in Leamington Spa from 28th - 30th October, 1957.

There are, at present, 23 Sections having Representatives in the Group.

Mr. A. G. Hayek was Chairman of the Group during the year.

#### **Standards Committee**

The Standards Committee has continued its work of commenting on draft British Standards Specifications and nominating Institution representatives to serve on B.S.I. Technical Committees.

Following the reconstitution of B.S.I. Technical Committee MEE/6/3 to revise B.S.886 “Terms and Definitions of Cutting Tools”, it is interesting to note that the Committee has completed its work and it would appear that the system proposed by Mr. G. V. Stabler, M.I.Prod.E., is likely to be adopted. Mr. Stabler has spent a great deal of time and energy on this subject, and we are much indebted to him.

Various surveys have been carried out to obtain information required by representatives on B.S.I. Technical Committees, and also on Committees of the International Standards Organisation. An International Standards Sub-Committee has recently been formed, under the Chairmanship of Mr. T. A. C. Sparling, and it is felt that this Sub-Committee will be of valuable assistance to the Institution.

The I.Prod.E./B.S.I. Standards Advisory Committee on the use of Standards in Industry was responsible for organising the fourth Annual Conference of Standards Engineers, which was held on 21st May 1958, at the Connaught Rooms. The Conference was opened by Mr. F. J. Erroll, Parliamentary Secretary to the Board of Trade. Mr. H. Stafford was Chairman of the meeting and some 250 delegates attended.

The Joint Advisory Committee which provides liaison between the Institution and B.S.I. continues to hold regular meetings.

The Chairman of the Standards Committee during the year was Mr. H. Stafford.

#### **The Editorial Committee**

*The Journal*—The Editorial Committee has again devoted much time and thought to the production of a Journal of high quality at reasonable cost, and is to be congratulated on achieving this aim despite the further increase in postal and telephone charges which came into operation in October, 1957. It has, in fact, been possible to increase the size of the Journal in a number of issues during the year, and much favourable comment has been received on the continuing good standard and varied interest of the editorial content.

Subscriptions to the Journal from outside the membership have increased during the year, notably from overseas, which indicates that the Journal's sphere of influence continues to expand.

During the year, a number of outstanding Papers were published in the Journal, and attracted considerable interest. The demand outside the membership for the January and June 1958 Journals, in particular, was such that these issues are now out of stock.

It is the Editorial Committee's aim to widen the field of material hitherto considered for publication in the Journal, and particular attention is at present being paid to research work in production engineering being carried out in universities and technical colleges.

Advertising—It is gratifying that the level of advertising has been maintained and even increased in some months during the year, although no relaxation of effort can be contemplated. During the period under review, the Committee was pleased to learn that the Institution's Advertising Agents had appointed a special representative to look after the Journal. This representative now attends meetings of the Editorial Committee from time to time, when various points and problems are discussed, and it is considered that this appointment will be of considerable mutual benefit.

The Chairman of the Editorial Committee makes a point of meeting the Advertising Agents and the Printers of the Journal on several occasions during his term of office, to discuss the improvement and development of the Journal. The Chairman of the Committee during the year was Mr. John Mitford Brice.

#### **Papers Committee**

The main task of the Papers Committee is to promote the supply of high grade papers for publication in the Journal, and to make arrangements for the presentation of the Institution's Named Papers.

The Committee notes with interest the increasing tendency for Sections to concentrate on film and discussion evenings, informal talks and works visits to complete their programmes. This means that fewer papers are received from Sections, but it is hoped that these will be replaced by more Regional Papers. The Committee is trying to stimulate the submission of short papers on specific production problems, written by younger members of the Institution, and not necessarily presented to a Section meeting. In this aim, the Chairman of the Committee has enlisted the support of all Section Chairmen and has offered advice and guidance to prospective authors, if requested.

The Committee has been successful in obtaining a number of authoritative papers which have been offered to Sections where it was thought there was a particular interest in the specific subject.

#### **Named Papers**

During the year under review, five Named Papers have been presented as follows:

*The 1957 Sir Alfred Herbert Paper* was presented at the Royal Institution, London, on 31st October, 1957, by Dr. H. Barrell, Superintendent of the Metrology Division, National Physical Laboratory. His subject was "The Bases of Measurement" and the Paper was published in the January, 1958, Journal.

*The 1957 Viscount Nuffield Paper* was presented at the University of Bristol on 6th February, 1958, by the Rt. Hon. The Lord Hives, who spoke on "Technical Education for Production Engineers—Some Reminiscences and Experiences". This Paper was published in the April, 1958, Journal.

*The 1957 George Bray Memorial Lecture* was presented at the University of Leeds on 24th March, 1958, by Dr. V. E. Yarsley, of Yarsley Research Laboratories, whose subject was "The Fabrication of Plastics". The Paper was published in the July, 1958, Journal.

*The Lord Sempill Paper* was presented on 2nd January, 1958, at the Sixth Annual Aircraft Production Conference at the University of Southampton, by Mr. Boyd K. Bucey, Assistant to the Vice-President, Manufacturing, of the Boeing Airplane Company. Mr. Bucey spoke on "Manufacturing in the Aeronautic Age" and his Paper appeared in the March, 1958, Journal.

*The E. W. Hancock Paper* was presented for the first time on 20th May, 1958, at the Production Conference, Olympia, London, by Mr. Lewis T. Wright, Chairman of the British Productivity Council and General Secretary of the Amalgamated Weavers Association. The subject was "Human Relations in Industry—Men, Women and Work" and the Paper was published in the September, 1958, Journal.

#### **Medal Awards 1956/57**

The Papers Committee, having carefully considered the Papers eligible for the Awards, made the following recommendations:

*Medal for the Best Paper presented to a Section or Region by a Member:* to Mr. J. A. Grainger, M.I.Prod.E., for his Paper entitled "New Techniques in Sheet Metal Forming". (Published in the September, 1957, Journal.)

*Medal for the Best Paper presented to a Section or Region by a Non-Member:* to Mr. A. G. Thompson, for his Paper entitled "Measuring and Forecasting Cost Data in Highly Variable Production". (Published in the December, 1957, Journal.)

There was only one Paper eligible for the Hutchinson Memorial Award (for the best Paper presented to a Section or Region by a Graduate Member) and as, in the opinion of the Committee, it fell short of the required standard, it was agreed to make no recommendation. The Committee note with some concern, however, that this is the second consecutive year in which it has not been possible to make a recommendation for this Award, because of the paucity of entries, and greatly regret this apparent lack of interest in Papers on the part of the younger members of the Institution.

The Chairman of the Committee during the year was Mr. A. A. Francis.

#### **Honours**

Her Majesty the Queen has been graciously pleased to confer honours on the following members of the Institution:

Viscount Nuffield, Hon.M.I.Prod.E.

S. J. Harley.

W. A. Summers; C. Metcalfe.

E. W. Hancock, Hon.M.I.Prod.E.; A. Sykes.

### **Obituary**

It is with deep regret that the deaths of 40 of our members must be recorded. Their names have been published in the Journal.

### **Headquarters Staff**

Our Senior staff has been increased by the appointment of Mr. I. B. King, as Assistant Education and Technical Officer. Apart from Mr. King's appointment, there have been no other changes in our Senior staff and it is gratifying to know that we are thus able to maintain continuity in our administration. There have, of course, been changes in junior staff; this is inevitable in an organisation which has its Headquarters in the West End of London and is, therefore, in direct competition for staff with many of the great industrial and commercial houses. As Chairman of our Institution's Council, I come into frequent contact with H.Q. staff and I can assure you that they are very hard-working and conscientious on your behalf.

Our Headquarters staff do their work with keenness and enthusiasm and I am sure you will all join me at this 36th Annual General Meeting in expressing our thanks and our appreciation of the excellent way in

which Mr. Woodford and his staff continue to serve the Institution.

### **The President**

I began this report by referring to the splendid work of Mr. Gregory, as Chairman of Council. I now take this opportunity of paying a tribute to our President, The Right Honourable The Earl of Halsbury. How fortunate we have been over the years in our choice of Presidents! Lord Halsbury is now in his second year of office. He has travelled far and wide on behalf of the Institution, and he has met a very large number of members. All those who have the privilege of personal meetings with our President cannot fail to be impressed with his immense breadth of vision and academic distinction. Lord Halsbury is a man of many and varied interests and we are extremely grateful indeed to him for devoting so much of his time to the affairs of our Institution, from which we shall get immeasurable benefit in the future.

In asking you to receive this report of your Council for the year ended 30th June, 1958, I do so with every confidence that you will agree that your Council have discharged their responsibilities conscientiously and effectively on your behalf.

THE INSTITUTION OF PRODUCTION ENGINEERS

BALANCE SHEET as at 30th JUNE, 1958

	1957		1957		1957	
	£	£	£	£	£	£
<b>Accumulated Funds and Surplus</b>						
The Viscount Nuffield Gift	25,000		25,000		35,000	
The Lord Austin Prize Fund	500		500			
The Hutchinson Memorial Fund	100		100			
The George Bray Memorial Fund	500		500			
— 26,100			26,100			
1,500 Building Maintenance Reserve		2,000		3,355		
Life Subscriptions: Less amount transferred to Income and Expenditure Account	1,148		1,188			
27,111 Income and Expenditure Account			30,158			
55,859			59,446			
61 Melbourne Prize Account		64				
<b>Current Liabilities</b>						
Sundry Creditors	10,413		6,360		4,645	
Subscriptions Received in Advance	503		243		1,100	
— 10,916			6,603		44,100	
<b>Fixed Assets</b>						
Freehold Premises: at cost						35,000
Freehold Premises: Cost of Alterations and Equipment, less Donations, Reserves, etc.:						
Balance at 1st July, 1957						3,355
Less Receipts during year						38
						3,317
Furniture, Fittings and Plant at the net amount standing in the Institution's books at 30th June, 1948						1,531
Additions less Sales						10,306
Less Depreciation						6,024
Fund Investments at cost: as scheduled (Market Value £871)						5,813
<b>Current Assets</b>						
Sundry Debtors, Deposits and Stocks						12,786
Cash at Bank and in Hand						5,317
United Building Society — Deposit (South Africa)						2,780
						20,883
<b>£66,836</b>			<b>£66,113</b>		<b>£66,836</b>	<b>£66,113</b>

The Rt. Hon. THE EARL OF HALSBURY, *President.*

H. G. GREGORY,  
*Chairman of Council and Finance Committee.*

W. F. S. WOODFORD, *Secretary.*

**Report of the Auditors to the Members of The Institution of Production Engineers**

We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit. In our opinion proper books of account have been kept by the Institution so far as appears from our examination of those books. Audited Balance Sheets and Accounts have been received from each of the Councils and Sections outside the United Kingdom, and these have been incorporated in the above Balance Sheet and annexed Income and Expenditure Account. We have examined the above Balance Sheet and annexed Income and Expenditure Account which are in agreement with the books of account audited by us and the audited Accounts of the Councils and Sections outside the United Kingdom supplied to us. In our opinion and to the best of our information and according to the explanations given us the said Accounts give the information required by the Companies Act, 1948, in the manner so required and the Balance Sheet gives a true and fair view of the state of the Institution's affairs as at 30th June, 1958, and the Income and Expenditure Account gives a true and fair view of the excess of income over expenditure for the year ended on that date.

20, Bloomsbury Square,  
London, W.C.1.

21st October, 1958.

GIBSON, APPLEBY & CO.,  
*Auditors,  
Chartered Accountants.*

THE INSTITUTION OF PRODUCTION ENGINEERS

INCOME AND EXPENDITURE ACCOUNT for the year ended 30th JUNE, 1958

1957		1958		1957		1958		1957		1958	
£	£	£	£	£	£	£	£	£	£	£	£
<b>To Establishment</b>											
1,146	Rates	...	...	1,175		40,706		Renewals and Arrears	...	41,156	
1,546	Light, Heat and Cleaning	...		1,658		487		Transfers	...	624	
543	Repairs and Renewals	...		588		870		New	...	901	
— 3,235				— 3,421				Councils and Sections outside U.K.	...	5,019	
	<b>Administration</b>					4,573		Entrance Fees	...	696	
2,628	Postage and Telephone	...		2,976		422		Registration and Miscellaneous Fees	...	1,839	
4,435	Printing and Stationery	...		4,963						— 50,235	
343	Professional Charges and Insurance	...				1,390		„ Interest	...	597	
250	Audit	...		193		— 48,448		„ Journal	...	39,144	
	Travel, Entertaining and Meetings (other than Sections)	...		250		263		„ Sale of Proceedings	...	550	
2,366	Miscellaneous	...		3,037		39,156		„ Miscellaneous	...	21	
85				128		359		„ Examinations	...	225	
— 10,107				— 11,547		120		„ Annual Dinner	...	8	
20,468	„ Salaries	...		23,704		274					
	<b>Sections</b>					44					
2,161	United Kingdom	...		2,293							
2,415	Outside U.K. (Audit Fees £70)	...		3,032							
1,790	Central Services	...		1,666							
— 6,366				— 6,991							
	<b>Journal</b>										
30,253	Printing	...		30,465							
5,782	Postage and Envelopes	...		6,685							
169	Reporting	...		412							
— 36,204				— 37,562							
310	„ Institution Papers	...		504							
386	„ Hazleton Memorial Library	...		413							
	<b>Schofield Scholarship</b>										
299	Award	...		250							
137	Administration	...		109							
	— 316			— 359							
	<b>Donations and Subscriptions</b>										
883	„ Conferences	...		146							
	„ Miscellaneous	...		700							
79	Press Cuttings	...		62							
237	Bank Interest and Charges	...		268							
—	New Examinations	...		413							
	— 316			— 743							
	<b>Provisions</b>										
923	Depreciation—Furniture and fittings	...		1,143							
500	„ Building Maintenance Reserve	...		500							
— 80,134				— 87,733							
8,530	„ Balance—Excess of Income over Expenditure carried down	...		3,047							
£88,664				£90,780							
						£88,664					
											£90,780

APPROPRIATION ACCOUNT

1957		1957	
£	£	£	£
27,111	To Balance carried forward	...	30,158
£27,111			£30,158
		18,581	By Balance at 1st July, 1957
		8,530	„ Excess of Income over Expenditure brought down
		— 27,111	... 3,047
			£30,158

THE INSTITUTION OF PRODUCTION ENGINEERS

SUMMARY OF INCOME AND EXPENDITURE ACCOUNT

For the year ended 30th JUNE, 1958

	U.K.	Outside U.K.		U.K.	Outside U.K.
Expenditure ...	£84,669	£3,064	Income	...	...
Excess of Income over Expenditure ...	810	2,237		...	...
	<u>£85,479</u>	<u>£5,301</u>		<u>£85,479</u>	<u>£5,301</u>

NOTES: 1. The total of U.K. Expenditure, £84,669, includes the cost of supplying the Institution's Journal and other services to all Members outside the United Kingdom.  
 2. Cash remitted to London by Councils and Sections outside the U.K. during the year ended 30th June, 1958 and not included in the above figures amounted to £1,284.

ANALYSIS OF ASSETS AND LIABILITIES at 30th JUNE, 1958.

	U.K.	Outside U.K.		U.K.	Outside U.K.
Accumulated Funds and Surplus ...	£50,209	£9,237		£	£
Melbourne Prize Account—Australia	—	64	Fixed Assets		
<b>Current Liabilities</b>			Freehold Premises	... 38,317	—
Sundry Creditors ...	5,810	550	Furniture, Fittings and Plant	... 5,427	386
Subscriptions received in Advance ...	199	44	Fund Investments	... 1,100	—
Bank Overdraft ...	1,278	—		44,844	386
	<u>£57,496</u>	<u>£9,895</u>	Current Assets		
			Sundry Debtors, Deposits and Stocks	... 12,652	134
			Investment—South Africa	... 2,780	
			Cash at Bank and In Transit		
			Australia	... 3,181	
			Bombay	... 573	
			Calcutta	... 1,310	
			New Zealand	... 738	
			South Africa	... 424	
			Canada	... 369	
				<u>£57,496</u>	<u>£9,895</u>

## THE INSTITUTION OF PRODUCTION ENGINEERS

**INVESTMENTS AT COST, 30th JUNE, 1958**

# Lubrication Plus Protection

*Mobilux Grease* is a lithium-base lubricant of excellent structural stability and purity. It is a new, general-purpose grease superseding conventional greases. It provides effective lubrication for the majority of grease applications over a temperature range from minus 20°F to 250°F. It is exceptionally resistant to water washing and contains special additives to prevent rust formation. Both in the laboratory and in the field Mobilux Grease has proved its outstanding efficiency as a lubricant and protector.

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P. H. Lee	Edinburgh	F. Woodifield	Sheffield
G. V. Stabler	Glasgow	W. Castledine	Shrewsbury
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R. M. Evans	Leicester	S. Downie	Stoke-on-Trent
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H. Mason	Liverpool	S. G. E. Nash	Tees-Side
G. A. J. Witton	London	P. J. Shipton	Western
J. L. Gwyther	Luton	J. D. Nicholls	Wolverhampton
F. W. Cranmer	Manchester		Worcester

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B. Brewster	Coventry Graduate	F. A. Roberts	Melbourne Graduate
H. Scholes	Halifax & Huddersfield Graduate	H. E. A. Noble	Newcastle upon Tyne Graduate
J. Keightley	Leeds Graduate	P. M. Goodchild	Rochester Graduate
G. L. Smith	Liverpool Graduate	D. R. Wilson	Sheffield Graduate
P. Trosset	London Graduate	T. G. Mossman	Western Graduate
R. H. Cannon	Luton Graduate	P. F. W. Guest	Wolverhampton Graduate

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Eastern	...	A. B. Brook	Scotland	...	...	J. Nicolson Low
Midlands	...	A. C. Turner	South Eastern	...	...	J. Aikman
North Midlands	...	C. N. T. Manfull	Southern	...	...	J. W. Taylor
Northern	...	A. Smith	South Western	...	...	A. Eustace
North Western	...	J. P. Speakman	Wales	...	...	C. L. Griffiths

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### AUSTRALIA

<b>Adelaide (South Australia) ...</b>	B. H. M. Coombes, 11 Elmo Avenue, Westbourne Park, Adelaide, Australia.
<b>Melbourne (Victoria, Australia)</b>	A. G. Jones, 13 Laburnum Street, Middle Brighton, Victoria, Australia.
<b>Melbourne Graduate (Victoria Australia) ...</b>	E. K. Stephenson, 5 Olinda Street, Glen Waverley, Melbourne, Victoria, Australia.
<b>Sydney (New South Wales) ...</b>	K. G. Slorach, 98 Church Street, Castle Hill, New South Wales, Australia.

### CANADA

<b>Canada ...</b>	Frank R. Taylor, 67 Wasdale Crescent, Apt. 5, Toronto 19, Ontario, Canada.
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### INDIA

<b>Bombay ...</b>	C. R. Pal, The Crescent Iron & Steel Works Ltd., Goregaon (East), Bombay, S.D., India.
<b>Calcutta ...</b>	P. J. O'Leary, c/o Guest, Keen, Williams Ltd., 41 Chowinghee Road, Calcutta, India.

### NEW ZEALAND

<b>New Zealand ...</b>	G. Stedman, 3 Harrison Avenue, Belmont, Takapuna, Auckland, New Zealand.
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### SOUTH AFRICA

<b>South Africa ...</b>	A. Aitken, 209-211 Pharmacy House, 80 Jorissen Street, Johannesburg, P.O. Box 10837, South Africa.
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### UNITED KINGDOM

<b>Birmingham ...</b>	H. W. White, "Spring Pools", 677 Birmingham Road, Lydiate Ash, Bromsgrove, Worcs.
<b>Cardiff ...</b>	C. L. Griffiths, "Brynteg", 139 Tyntyla Road, Llwynypia, Rhondda, Glamorgan.
<b>Cornwall ...</b>	F. G. Hawke, 3 Bellevue Terrace, East Hill, Tuckinmill, Camborne, Cornwall.
<b>Coventry ...</b>	A. S. Hopkins, 39 Oaks Road, Kenilworth, Warwick.
<b>Derby ...</b>	P. Warburton, 16 Vicarage Road, Chellaston, Derby.
<b>Doncaster ...</b>	G. R. Wimpenny, 16 Tickhill Square, Denaby Main, Doncaster.
<b>Dundee ...</b>	J. Nicolson Low, Technical College, Bell Street, Dundee.
<b>Edinburgh ...</b>	A. S. Wilson, Ferranti Ltd. (Laboratory Workshop), Ferry Row, Edinburgh, 5.
<b>Glasgow ...</b>	W. H. Marley, G. & J. Weir Ltd., Cathcart, Glasgow, S.4.
<b>Gloucester ...</b>	B. E. Gwynne Clarke, "Chez-Nous", Okus Road, Charlton Kings, Cheltenham.
<b>Halifax &amp; Huddersfield</b>	C. W. Overin, 353 Whitehall Road, Westfield, Wyke, near Bradford, Yorks.
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<b>Lincoln ...</b>	H. Wright, 101 Longdales Road, Lincoln.
<b>Liverpool ...</b>	(Acting) H. Mason, 51 Stairhaven Road, Liverpool, 19.
<b>London ...</b>	R. J. C. Whitaker, The Glacier Metal Co. Ltd., Ealing Road, Alperton, Middlesex.
<b>Luton ...</b>	J. F. W. Galyer, Engineering Department, Luton & South Bedfordshire College of Further Education, Park Square, Luton, Bedfordshire.
<b>Manchester ...</b>	J. P. Speakman, 223 Douglas Road, Atherton, near Manchester.
<b>Newcastle upon Tyne</b>	A. C. Foskew, 35 Oakwood Avenue, Low Fell, Gateshead, 9.
<b>Northern Ireland ...</b>	J. G. Easterbrook, "Hileen", 22 Ascot Park, Knock, Belfast.
<b>Norwich ...</b>	J. I. Hilder, 2a Gorse Road, Thorpe, Norwich.
<b>Nottingham ...</b>	K. Liquorish, 28 Mona Street, Beeston, Nottingham.
<b>Oxford ...</b>	F. S. Chappell, 58 Lancut Road, Witney, Oxfordshire.
<b>Peterborough ...</b>	N. Holmes, "Arnciffe", 11 Mary Ardyn Road, Orton Longueville, Peterborough.
<b>Preston ...</b>	W. H. Preston, 25 Clifton Avenue, Leyland, Lancashire.
<b>Reading ...</b>	R. W. H. Mark, "The Beeches", 41 Reading Road, Woodley, Berkshire.
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<b>Sheffield ...</b>	T. F. Newton, c/o E. Pryor & Son Ltd., West End Works, Broom Street, Sheffield, 10
<b>Shrewsbury ...</b>	W. M. Buchan, Llanberis, 36 Mytton Oak Road, Shrewsbury.
<b>Southampton ...</b>	J. W. Taylor, High Mead, Kane's Hill, Thornhill, Southampton.
<b>South Essex ...</b>	F. Hopkinson, "Woodley", 40 Highfield Road, Chelmsford, Essex.
<b>Swansea ...</b>	C. L. Clarke, 11 Alder Road, Cimla, Neath, South Wales.
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<b>Tees-Side ...</b>	J. H. Cooper, 48 Hob Hill Close, Saltburn-by-the-Sea, Yorkshire.
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<b>Worcester ...</b>	R. Wheeler, Old Farm House, 7 Parish Hill, Bournheath, near Bromsgrove, Worcestershire.

#### CORRESPONDING MEMBER IN MIDDLE EAST

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P.O. Box 202, Takoradi, Ghana, West Africa.

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Manchester	...	...	R. A. Jones, 33 Kirkham Road, Heald Green, Cheshire.
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Rochester & District	...	...	J. R. Anderson, 63 Watling Street, Strood, Rochester, Kent.
Sheffield	...	...	E. Willcox, Ellis, Son, & Paramore Ltd., Spring Street Works, Sheffield, 3
Western	...	...	R. E. Everhard, 25 Boerton Road, Filton, Bristol.
Wolverhampton	...	...	T. J. Harrison, "The Dingle", Planks Lane, Wombourn, Staffordshire.

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##### *Honorary Secretary:*

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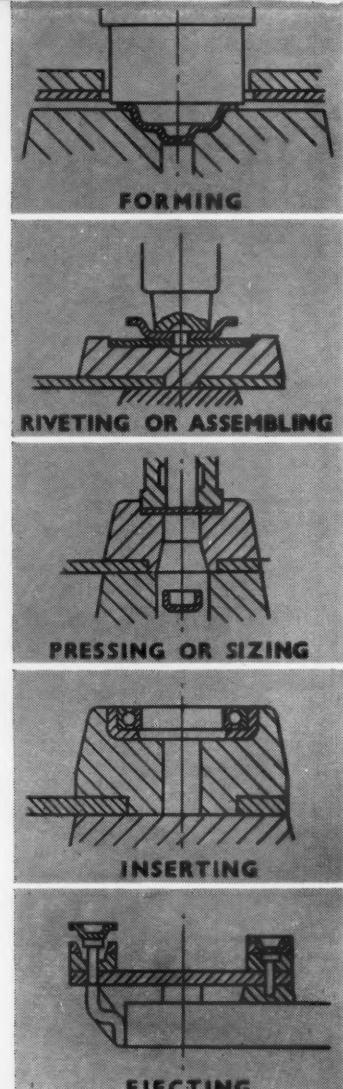
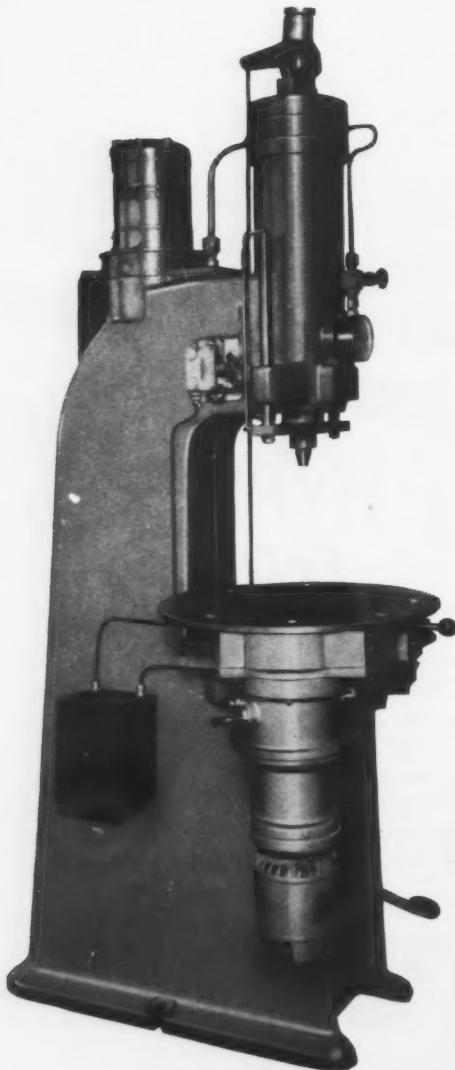
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AP 265-56

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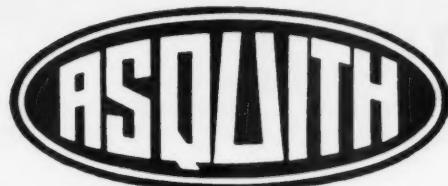
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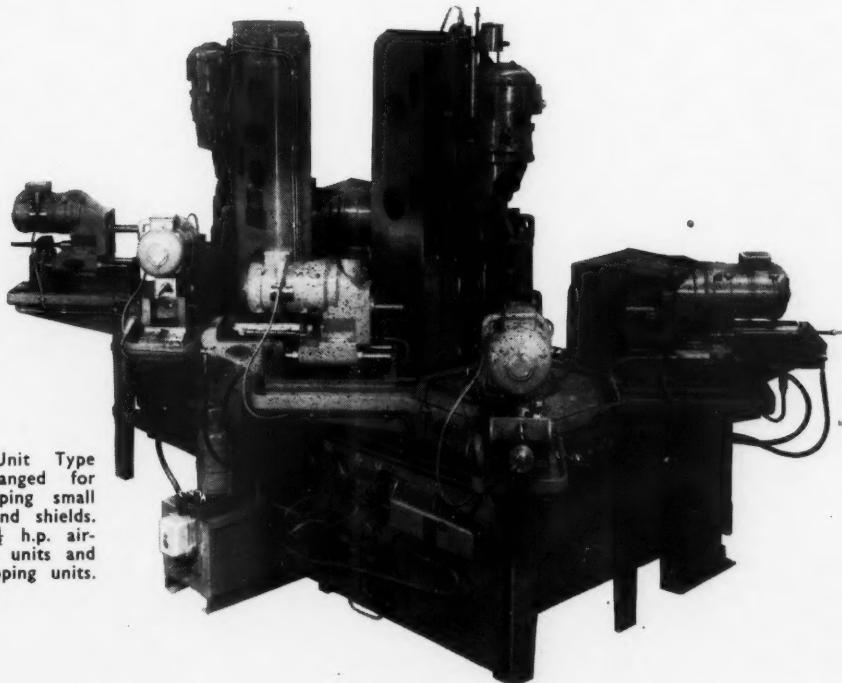
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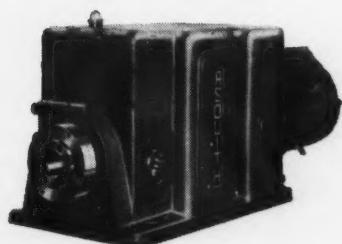
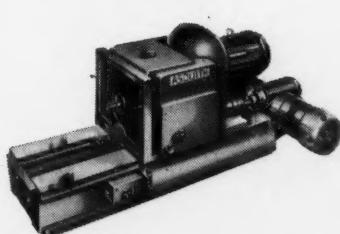
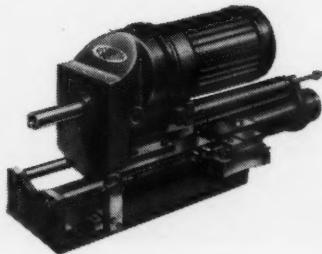


This Asquith Unit Type Machine is arranged for drilling and tapping small electric motor end shields. It incorporates  $\frac{1}{2}$  h.p. air-hydraulic drilling units and  $\frac{1}{2}$  h.p. screw tapping units.

$\frac{1}{2}$  h.p. AIR HYDRAULIC DRILLING UNIT

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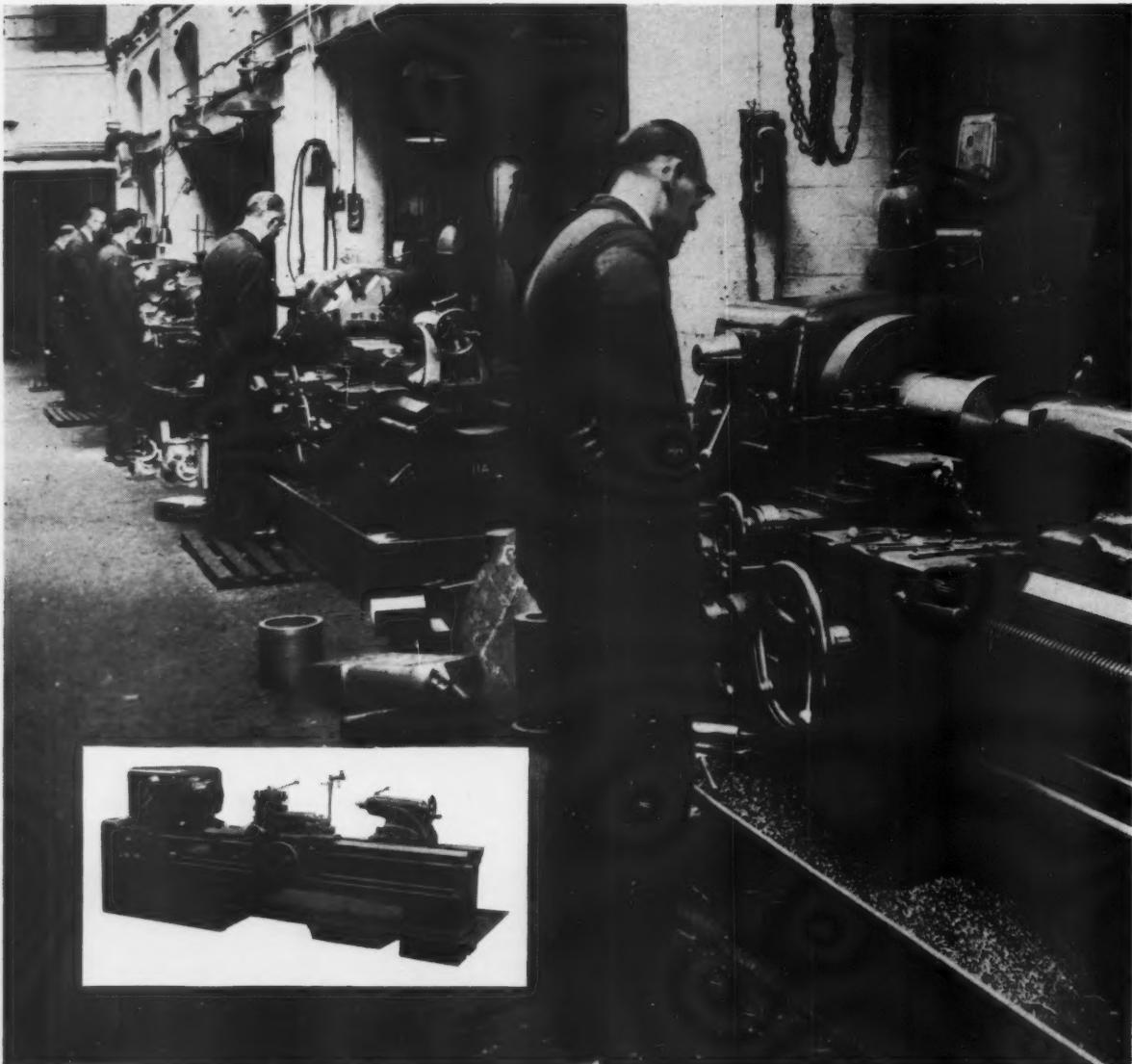
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### High Quality, Medium Capacity Lathes

These Swift lathes are capable of heavy-duty cutting and the range of speeds provided is adequate to take full advantage of carbide tooling. Available in two sizes, Type 9A with swing over bed 18½ in. by 4 ft. 0 in. between centres, and Type 11A which swings 22½ in.

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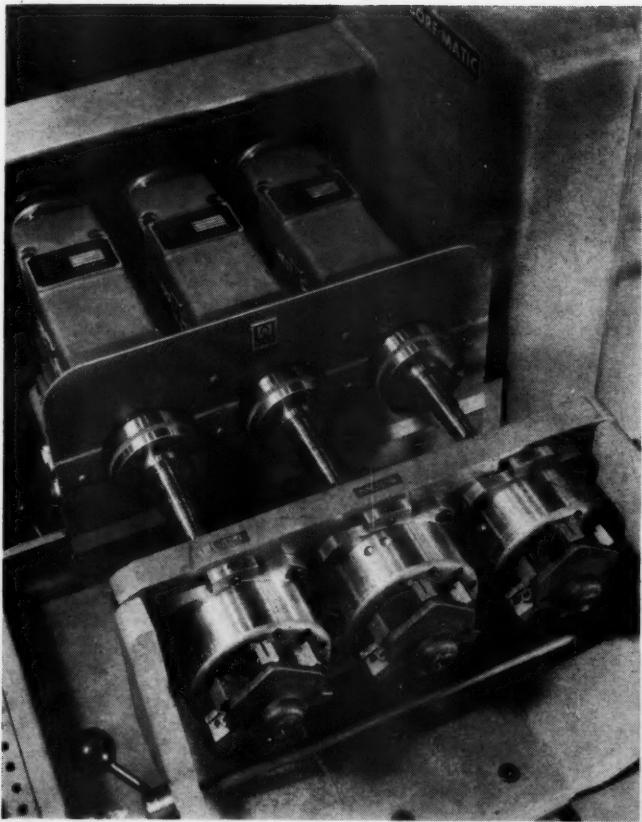
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# HEALD BOREMATICS

*... can be equipped with multi-tooling to increase production per cycle*



(Above) A typical multiple set-up on single-end machine to increase production per cycle. Three bronze bushings are machined in 23 seconds. Stock removal .015" - .120". Air or hydraulic clamping.

(Right) Set-up on a double-end machine providing multiple tooling for counter-boring and recessing hydraulic valve bodies. Quick-acting cam-locking work fixture.

Heald Models 221, 222 and 321 are built in this country. Our specialists are available to advise on their application and we will quote for machines completely toolled to suit customer's components.

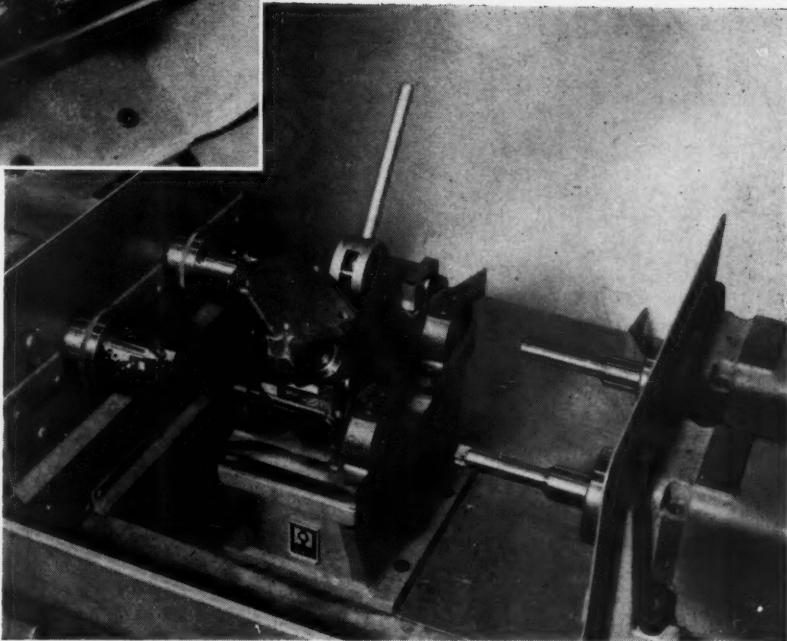
## Other features . . .

*Self-contained hydraulic power unit isolated from the machine to eliminate vibration.*

*Single- or double-end machine.*

*Direction of spindle rotation on the opposing heads of double-end machines ensures similar cutting conditions so that opposite-hand tools are not required.*

*Machine controls can be locked to ensure constant automatic repetition cycles.*



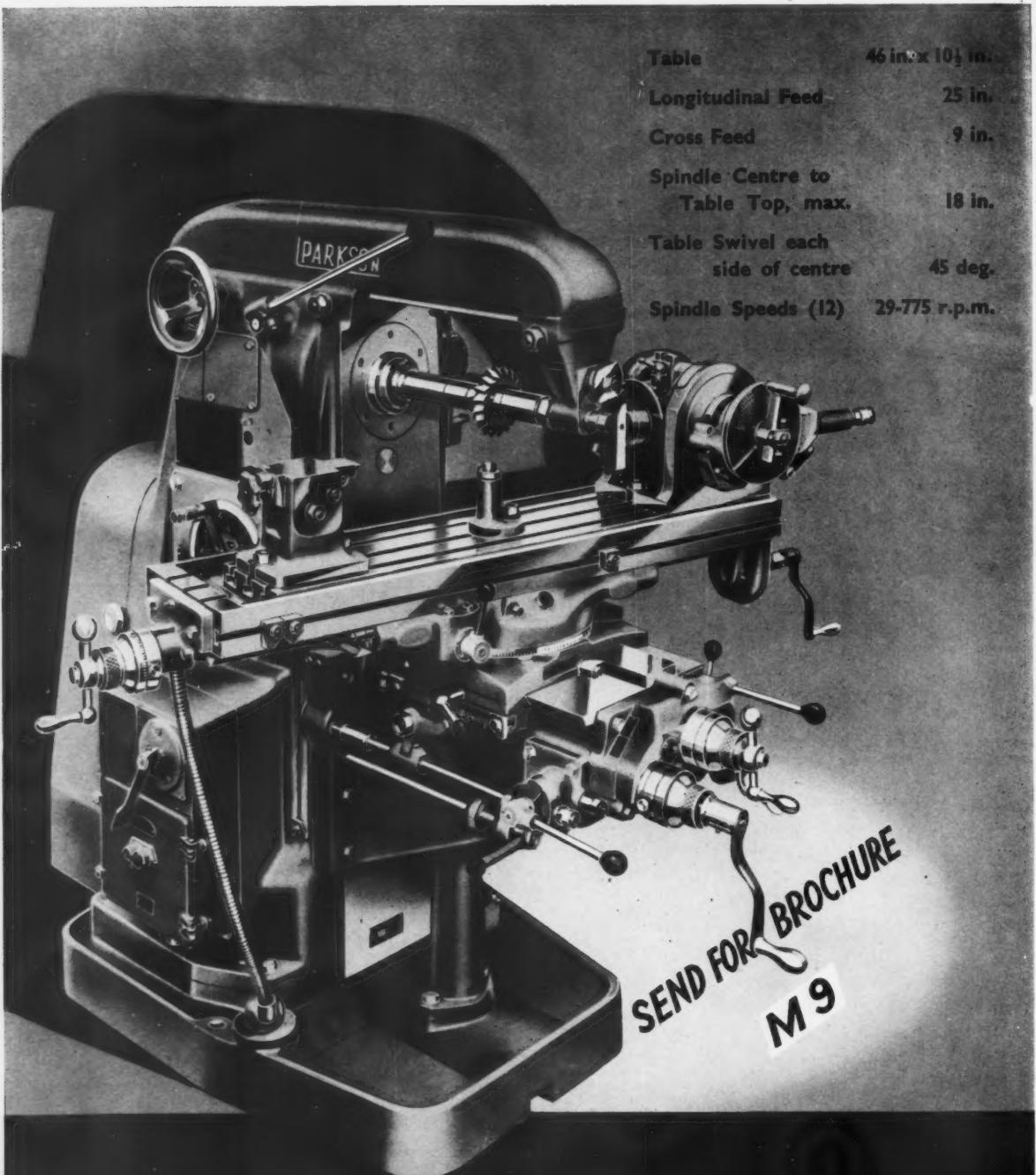
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<b>Table</b>	<b>46 in. x 10½ in.</b>
<b>Longitudinal Feed</b>	<b>25 in.</b>
<b>Cross Feed</b>	<b>9 in.</b>
<b>Spindle Centre to Table Top, max.</b>	<b>18 in.</b>
<b>Table Swivel each side of centre</b>	<b>45 deg.</b>
<b>Spindle Speeds (12)</b>	<b>29-775 r.p.m.</b>



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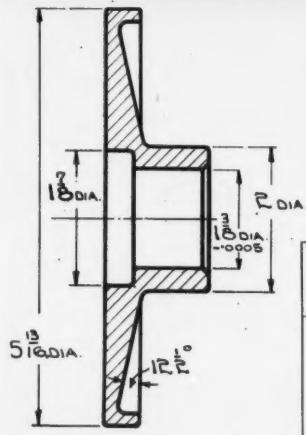
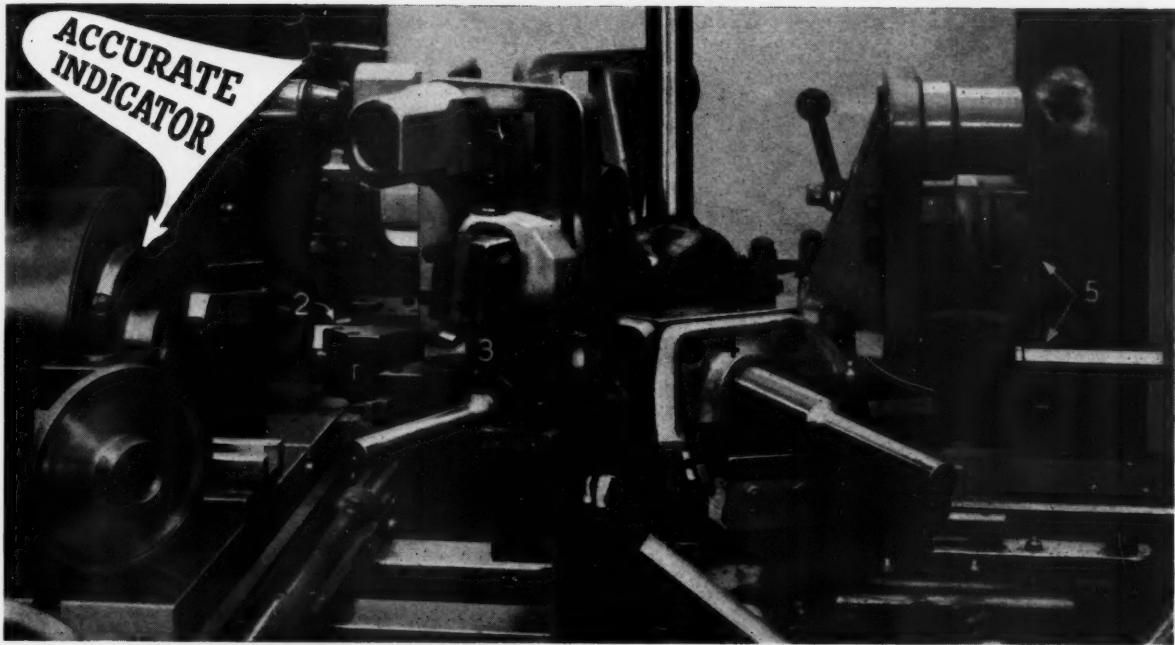
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P367-1B

# Maximum Production Special Tool Layouts



Tungsten Carbide Cutting Tools

CAST IRON  
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## Ward No. 3C CAPSTAN LATHE

FITTED WITH 200 mm. 3-JAW AIR CHUCK

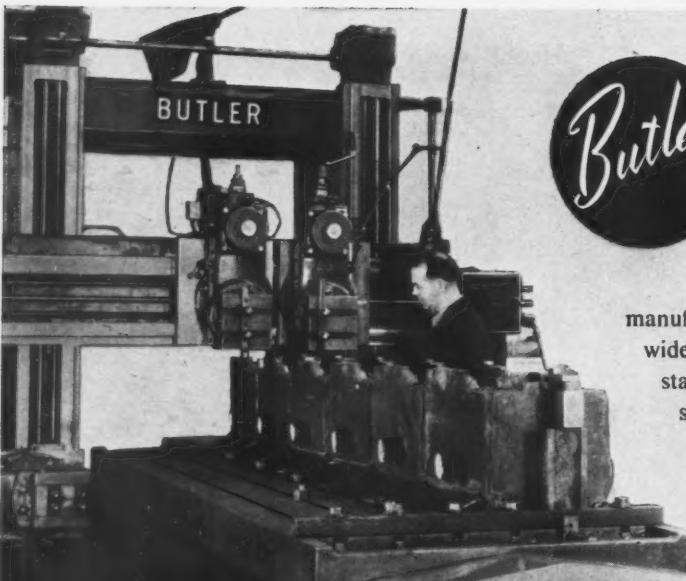
DESCRIPTION OF OPERATION	Tool Position		Spindle Speed R.P.M.	Surface Speed Ft. per Min.	Feed Cuts per inch
	Hex. Turret	Cross-slide			
1. Chuck on 0/dia. -	-	-	-	-	Hand
2. Double Face -	-	-	-	-	125
3. Rough Bore 1 3/8", Turn 2" and 5 1/4" dia.	1	-	Rear	260	405
4. Bore inside Rim and Radius Boss -	2	-	-	358	515
5. Turn Boss and Angle Face (2 cuts)	3	-	Centre	358	515
6. Finish Turn 0/dia. Face & Chamfer Boss	4	-	-	358	545
7. Reverse Component in Chuck Jaws	-	-	-	-	125
8. Bore 1 7/8" and 1 15/16" diams.	5	-	Front	260	405
9. Rough and Finish Face	-	-	-	-	128
10. Microbore 1 1/8" dia.	6	-	-	954	343
10. Remove.	-	-	-	-	125

Floor-to-Floor Time: 6 mins. each

**H. WARD & CO LTD**

SELLY OAK  
BIRMINGHAM 29  
TELEPHONE SELLY OAK 1131





## Spiral-Electric Planers

manufactured in a range from 3 ft. to 10 ft. wide with any length of table are offered as standard with two toolboxes on the cross-slide, two side toolboxes, solenoid tool relieving units, electric cross-slide locking and electric tachometer for registering the cutting and return speeds.

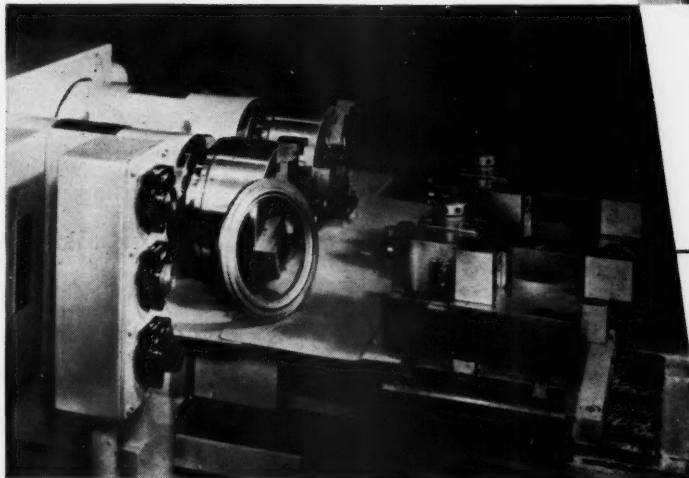
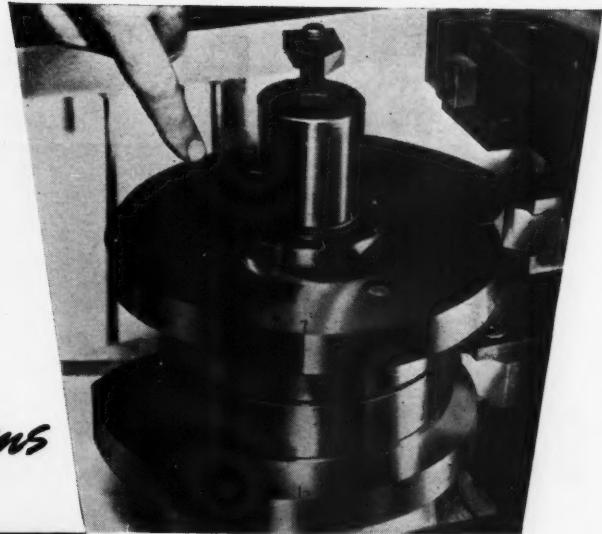
Photographs by courtesy of  
Clifton & Baird Ltd., Johnstone.



The No. 4A Model  
illustrated here admits  
work 48 in. wide by 48 in.  
high, the standard planing  
length being 10 ft.  
Openside, Rail Planing  
and Axlebox models  
also available.

*The BUTLER MACHINE TOOL CO. LTD.*  
MAKERS OF PRECISION PLANERS SHAPERS SLOTTERS  
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to **CONTOUR**  
**FACING** and  
**BORING** *problems*



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INTO PRECISION BORING !**



**NEW BRITAIN MODEL 36 CAM NEWMATIC  
PRECISION CONTOUR BORING MACHINE**

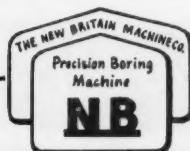


When working to "tenths" cams are the best method of maintaining accuracy, because cam control of the tool is *positive* control. The accuracy of parts produced on New Britain boring machines can't be affected by variable hydraulic pressures, ambient temperature, or play in complicated linkages.

With positive cam actuation in one direction and an air cylinder opposing, the cam provides positive control throughout the operating cycle. A single point tool performs all straight boring and turning as well as generating contours. Work and tools can be mounted on the table or in the spindle.

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A recent publication, "Araldite for Tooling" manual E.T., describes processes which save much time and money. It gives methods and formulae covering many applications of epoxy resins for tool making. A copy will gladly be sent on request.

## Let's face it



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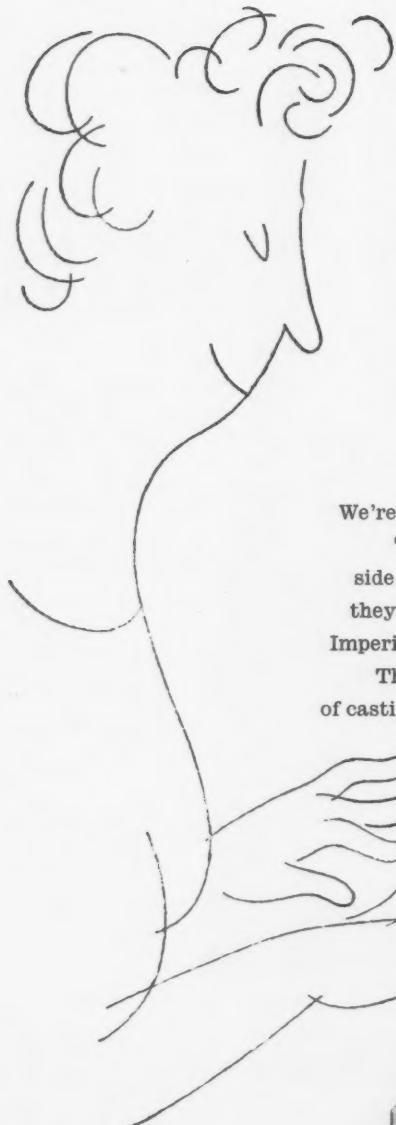
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*epoxy resins*

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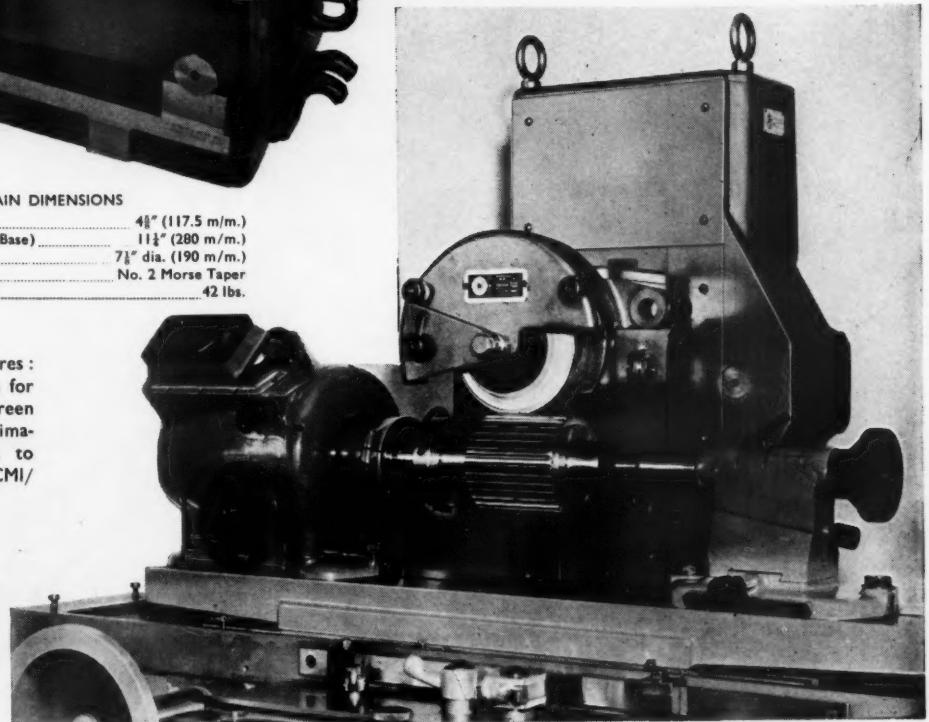
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ON SINE TABLE

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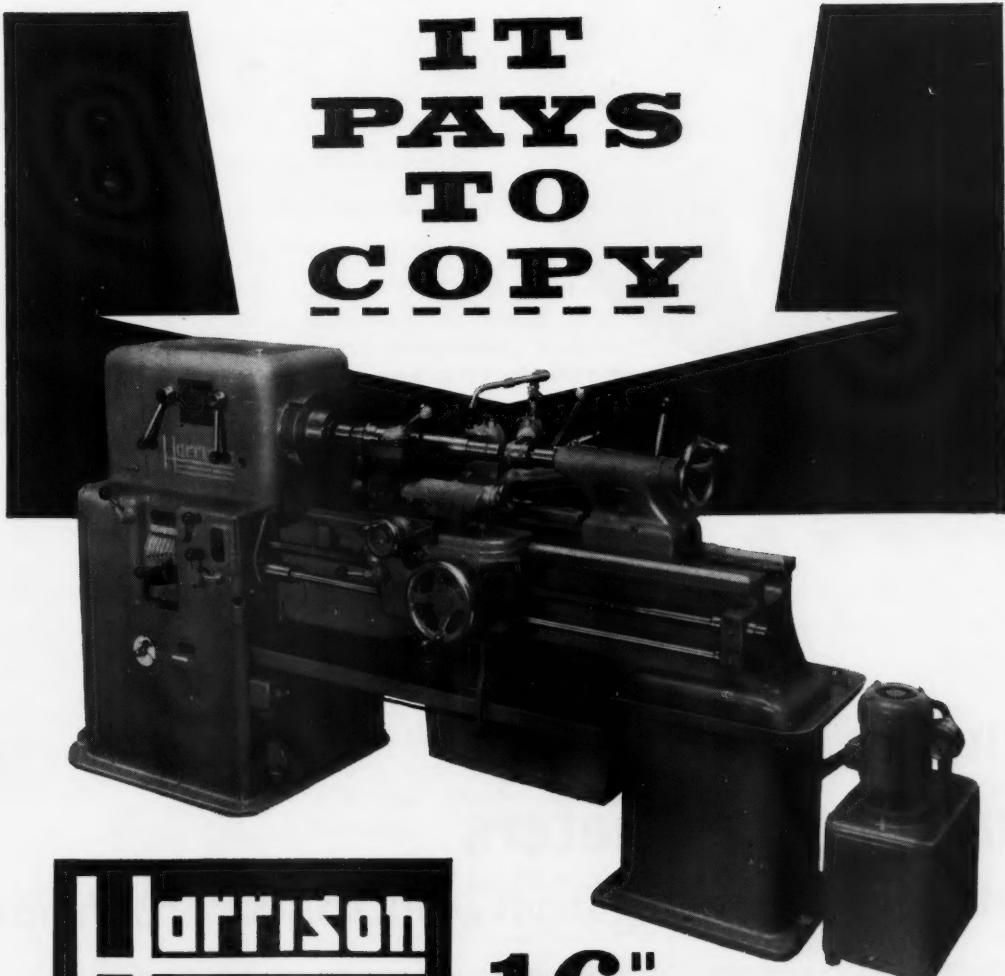


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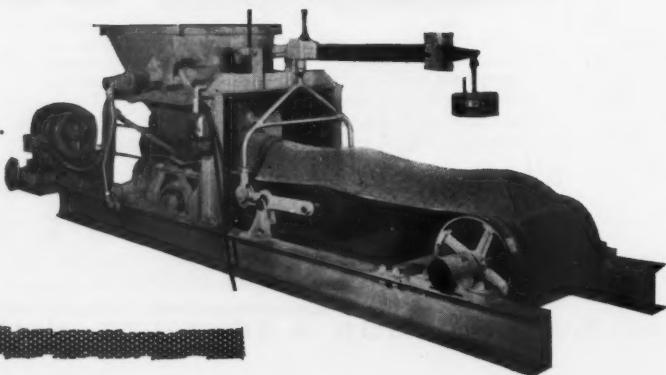
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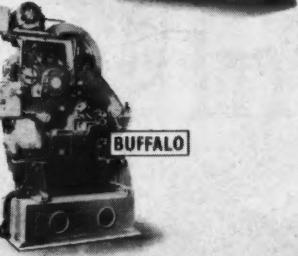
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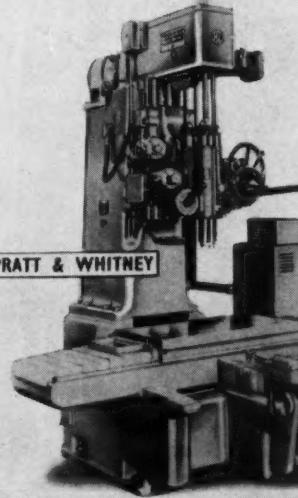
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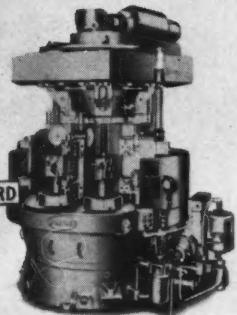
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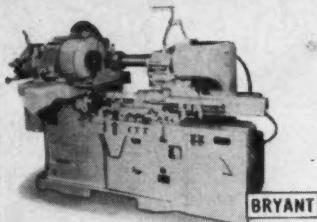
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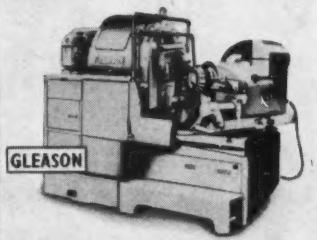
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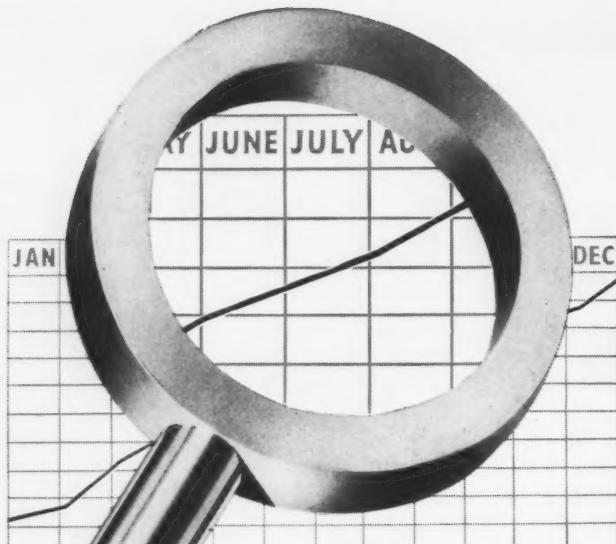


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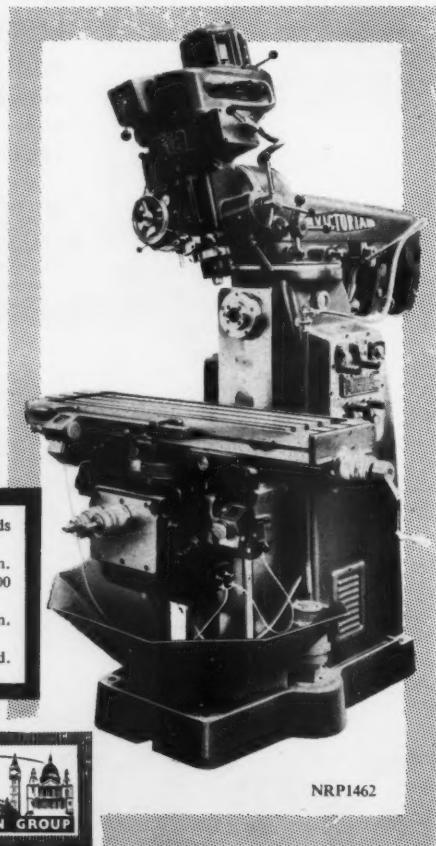
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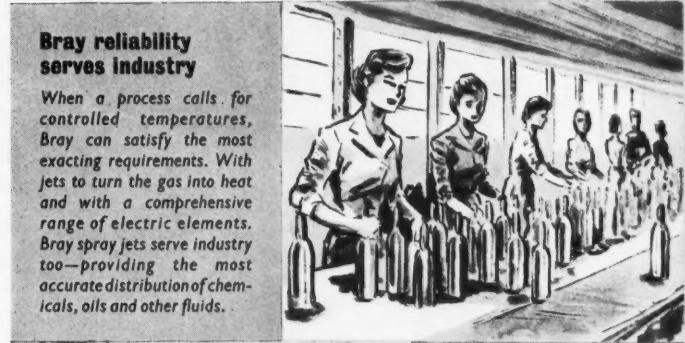


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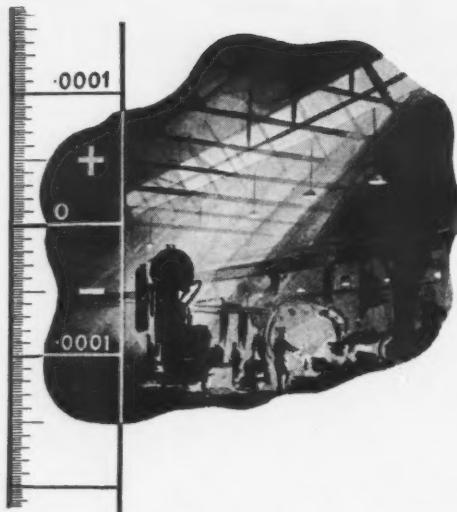


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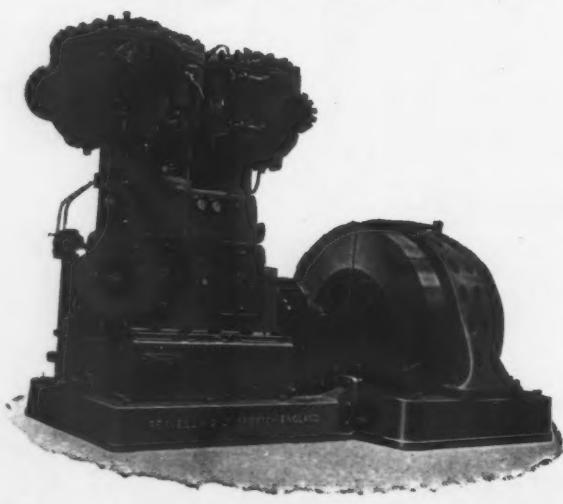
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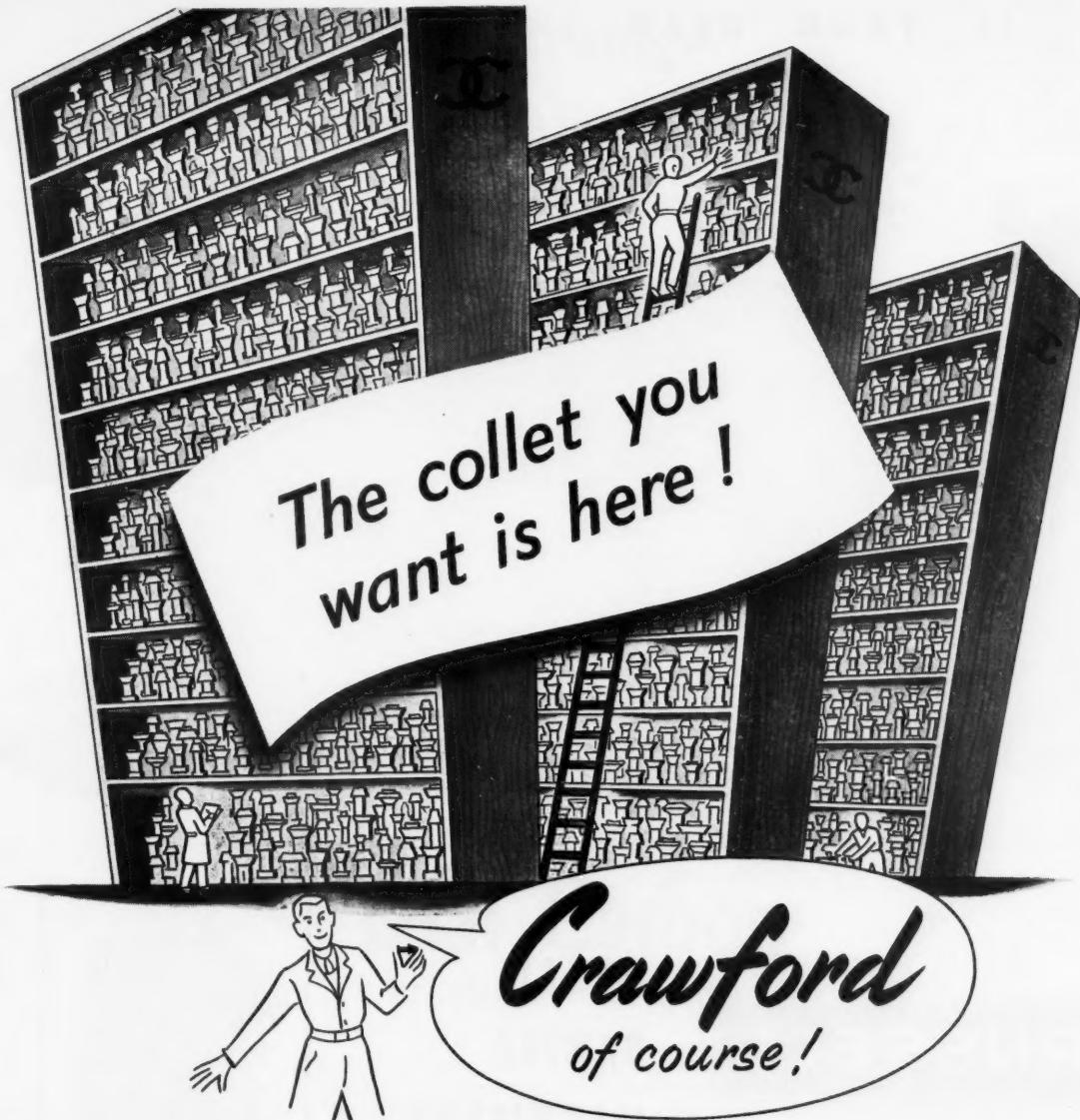
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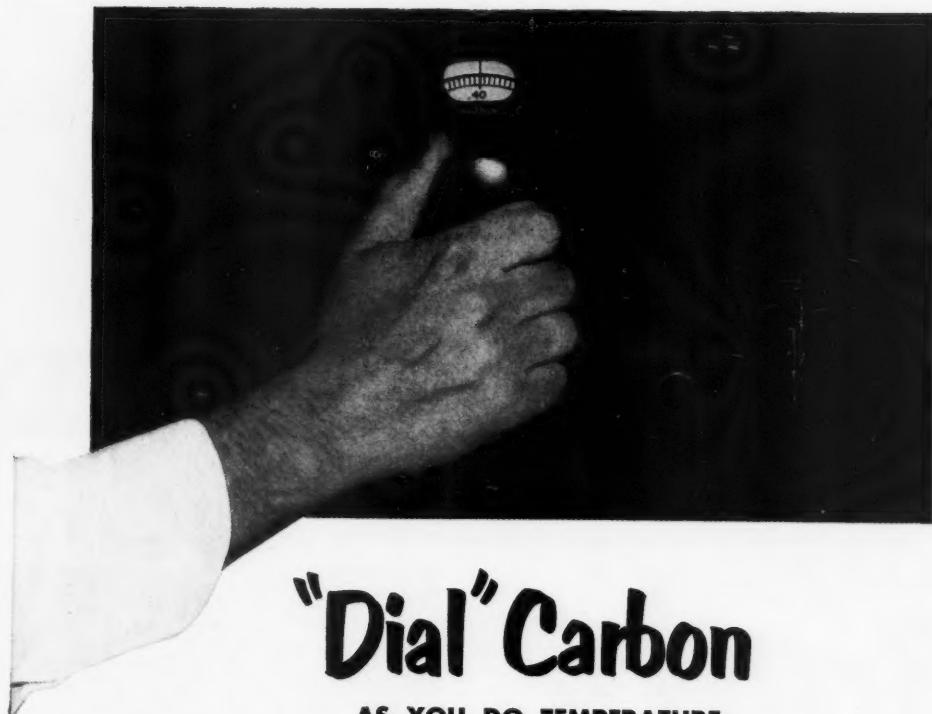
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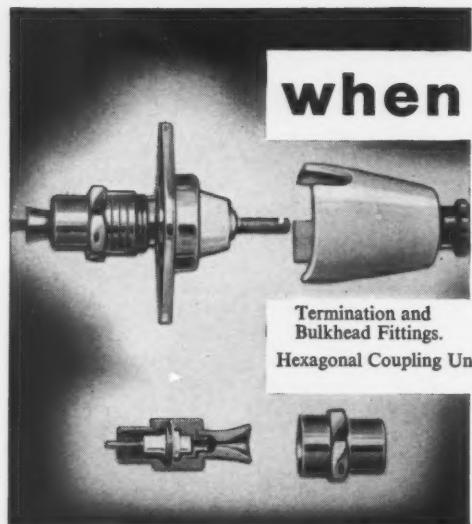


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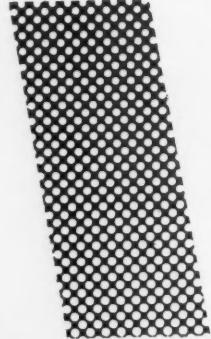
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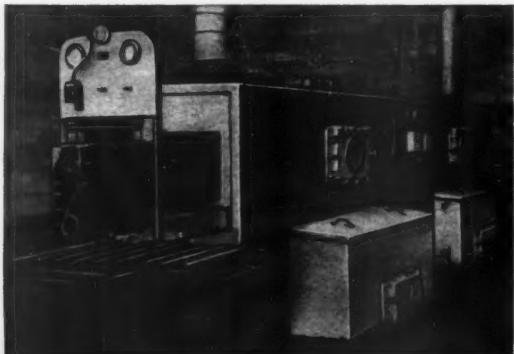
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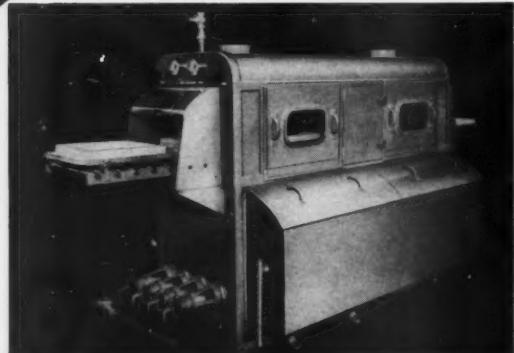
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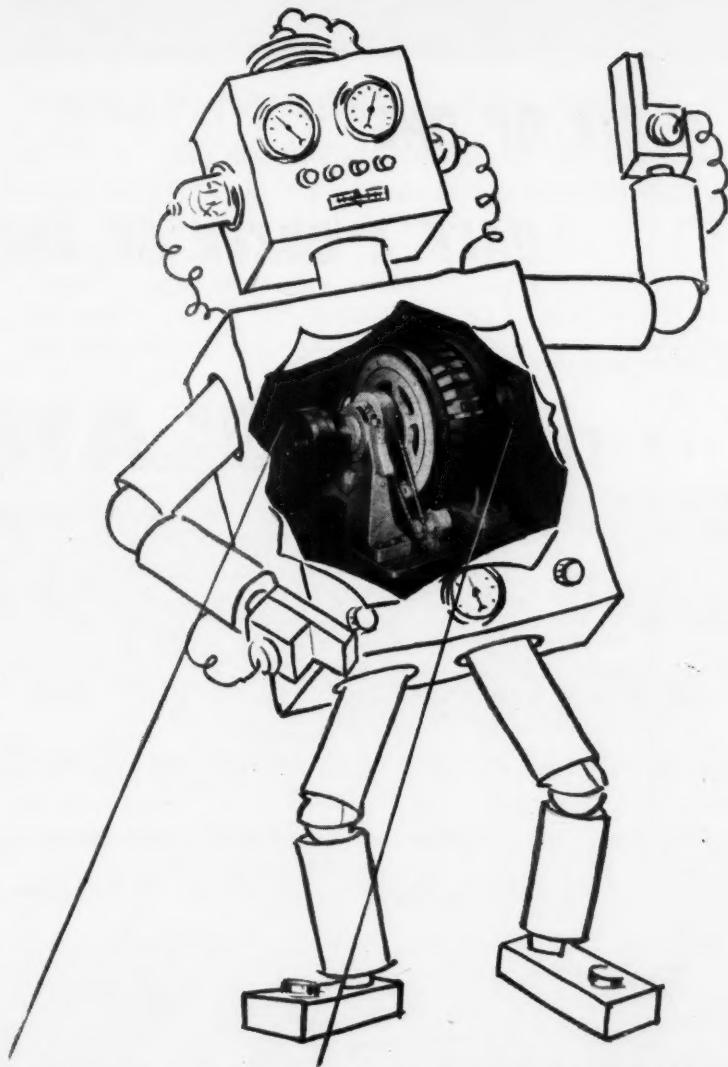
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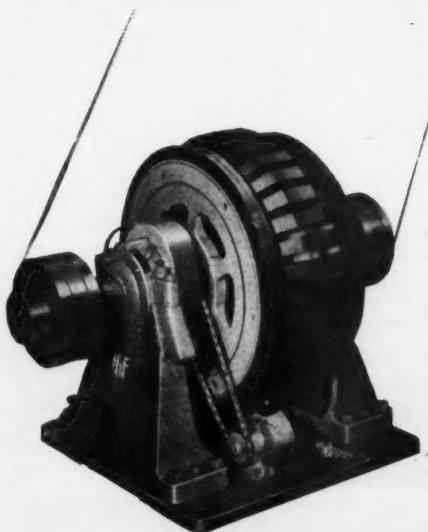
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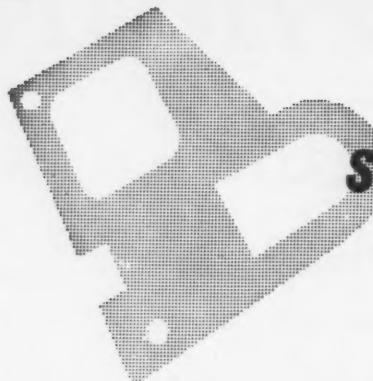
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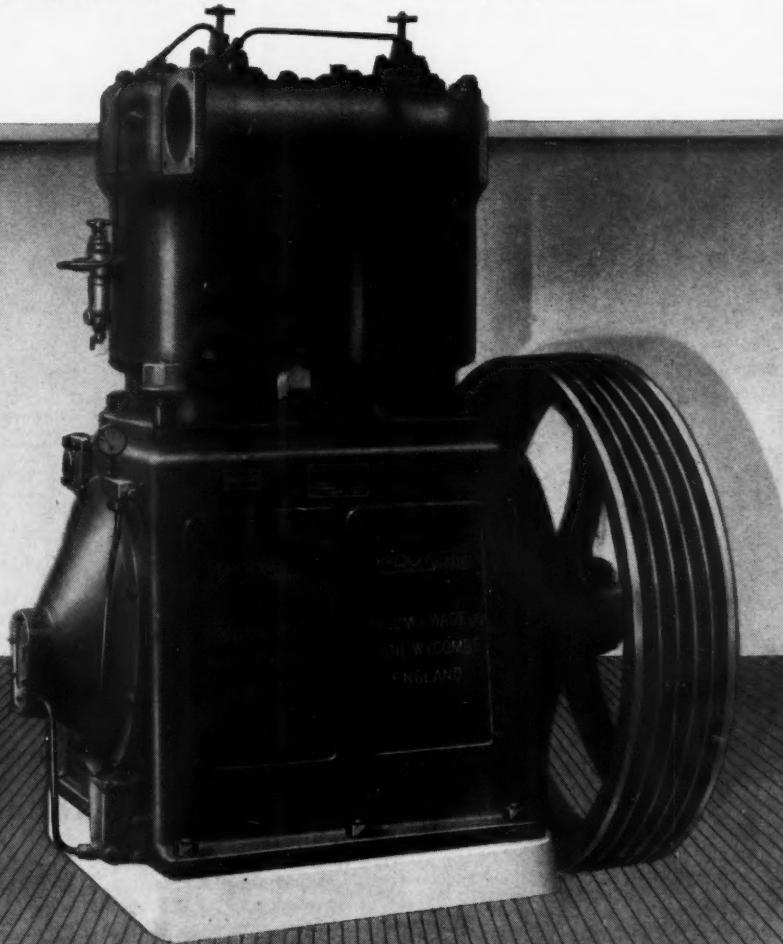
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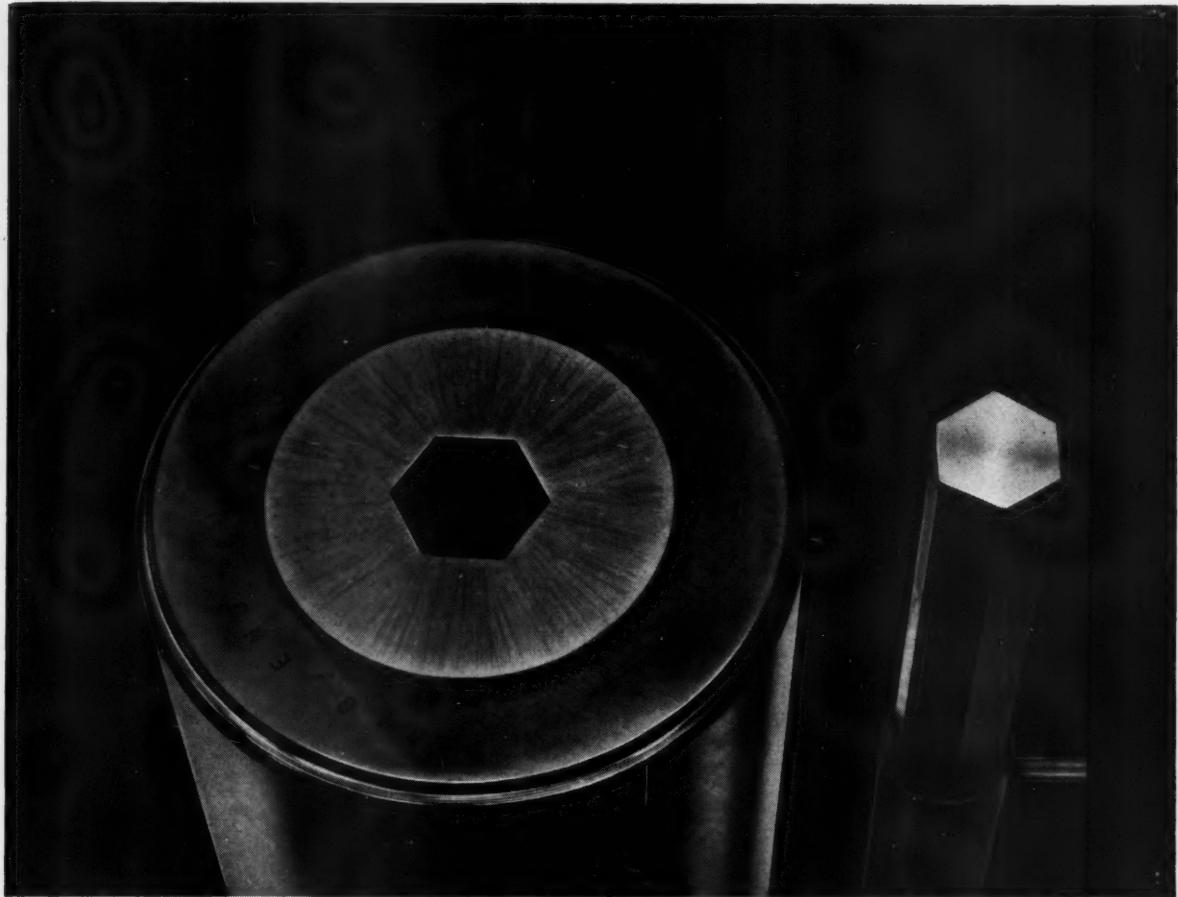
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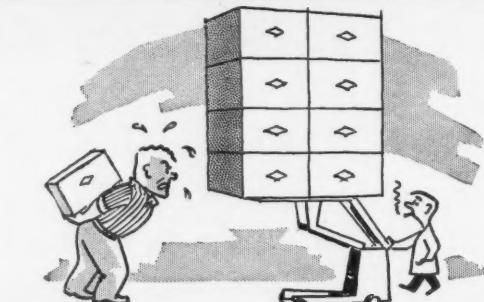
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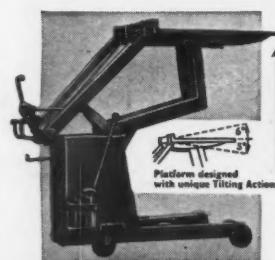
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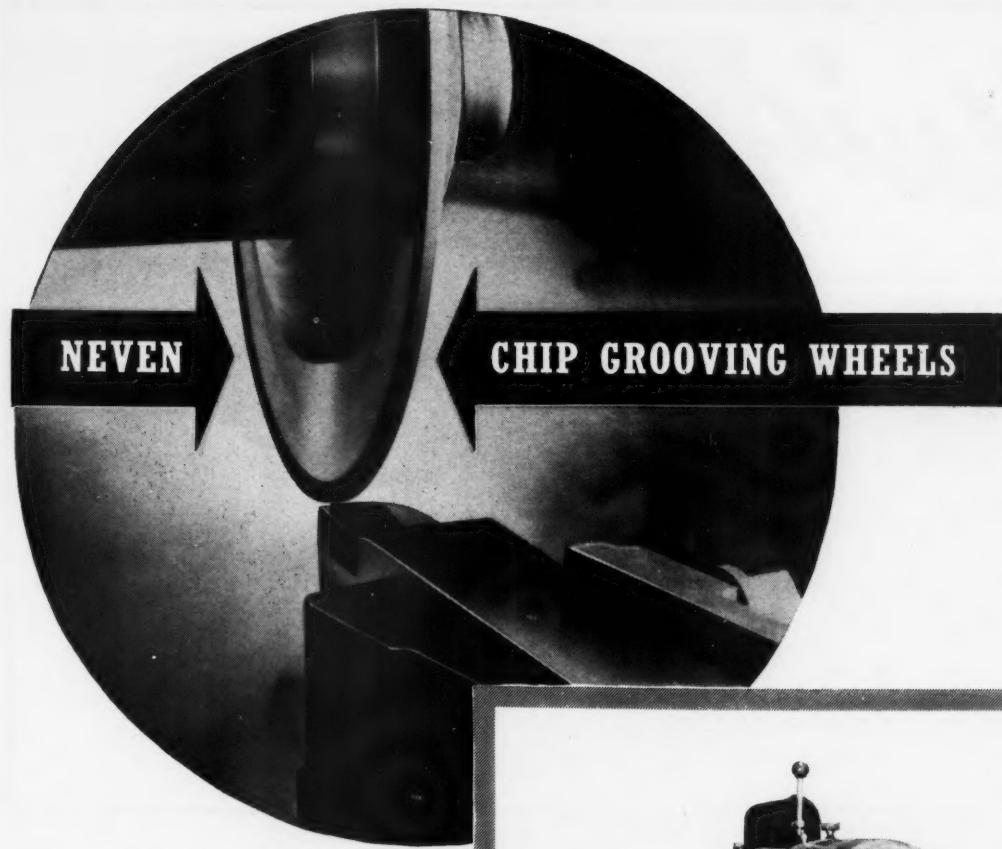


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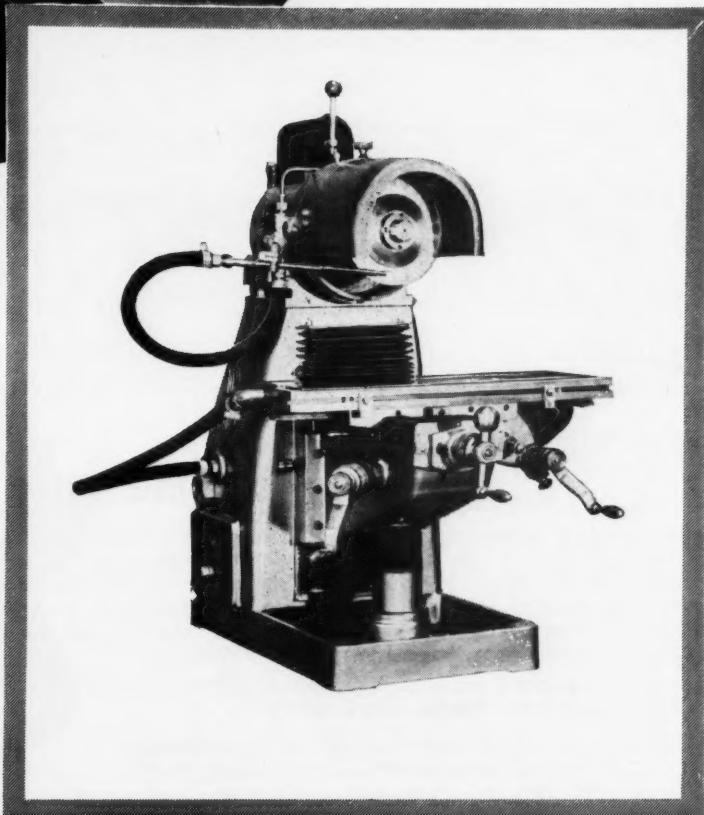
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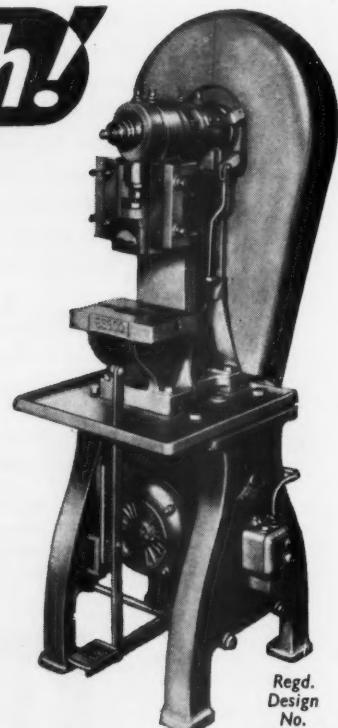
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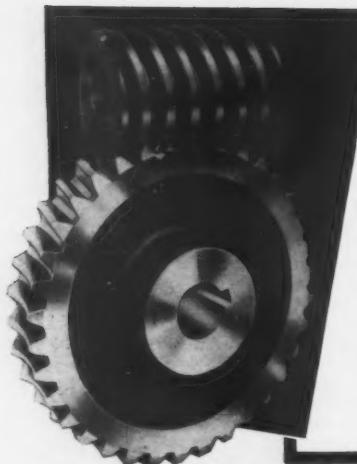
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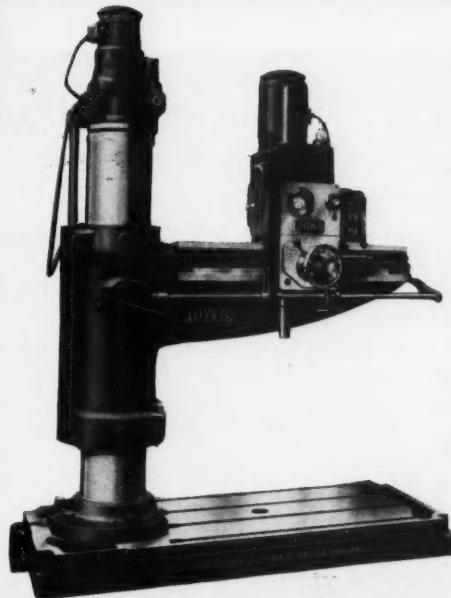


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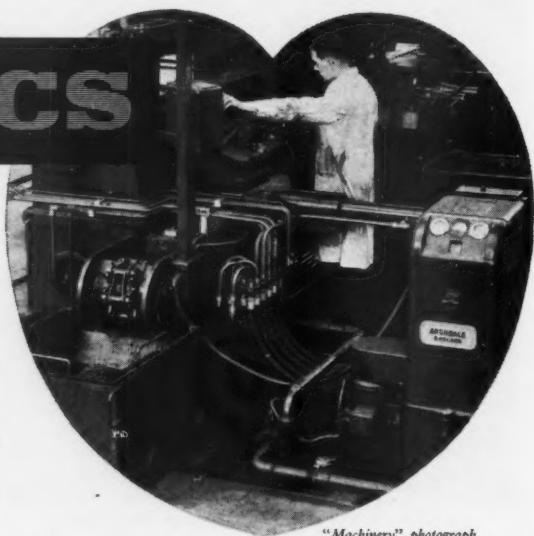
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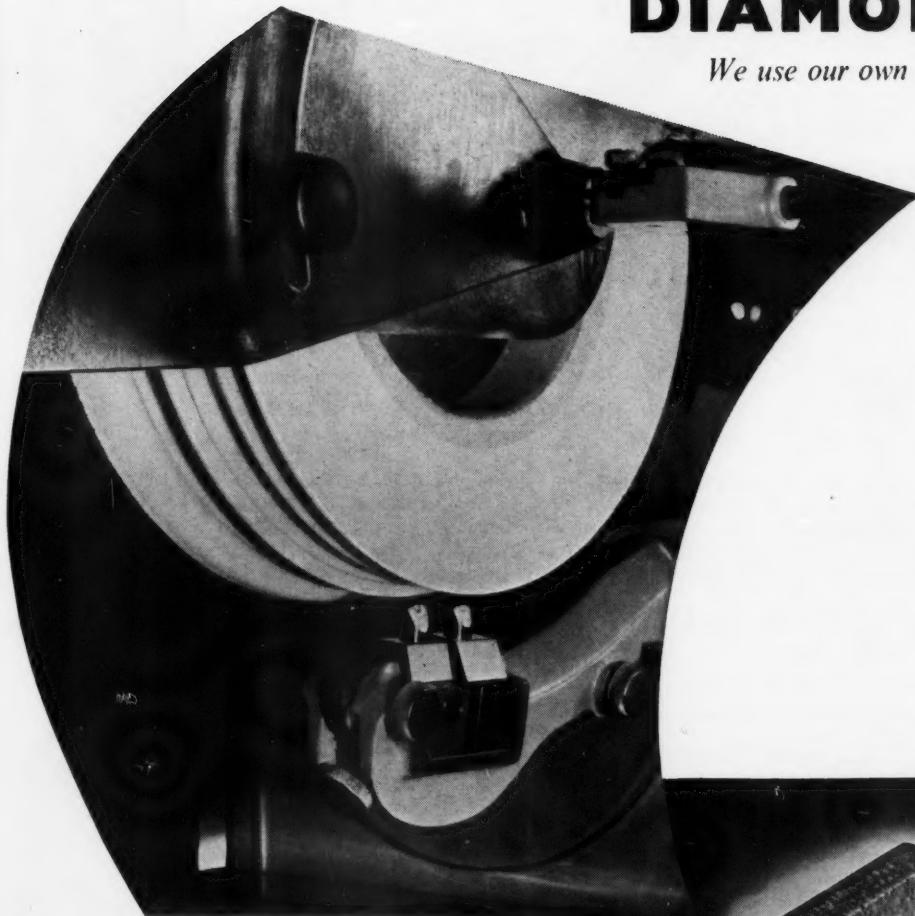
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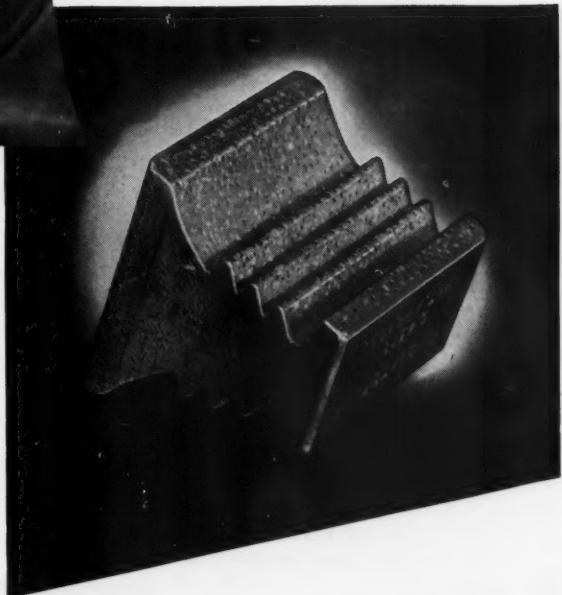
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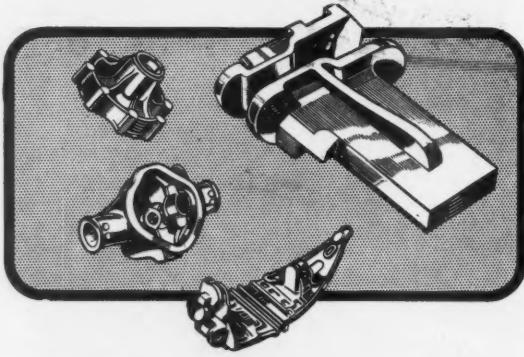


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Messrs. Glostics Ltd.,  
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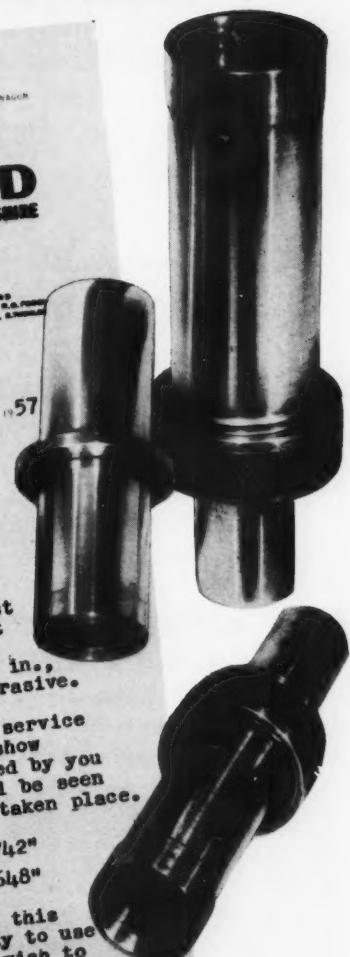
It is estimated that each nozzle has now been in service for more than 5,000 hours, and recent dimensional checks show the amount of wear to be almost negligible. We are advised by from the following figures that little, if any, wear has taken place.

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We feel that an outstanding performance such as this should not go unnoticed, and you are therefore at liberty to use the information contained in this letter in any way you wish to further the publicising of C.T.B. nozzles.

Yours faithfully,  
 for FODENS LIMITED.

E.J. PHIPPS,  
 CHIEF METALLURGIST.



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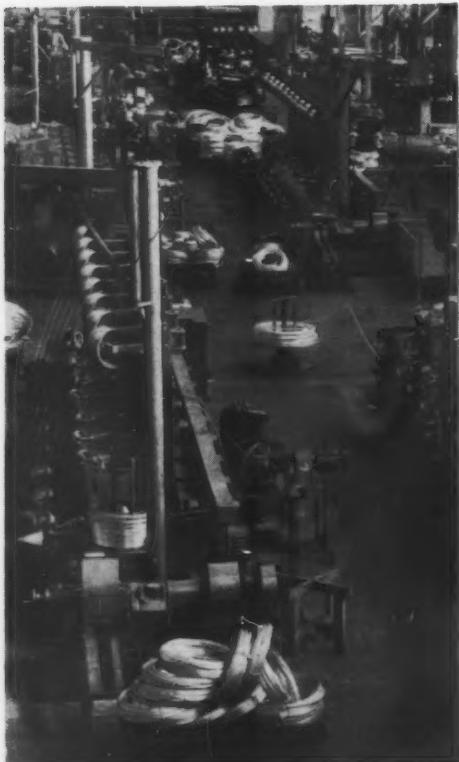
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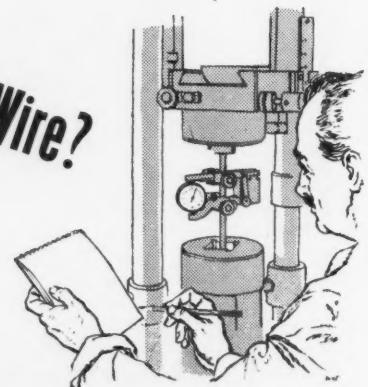
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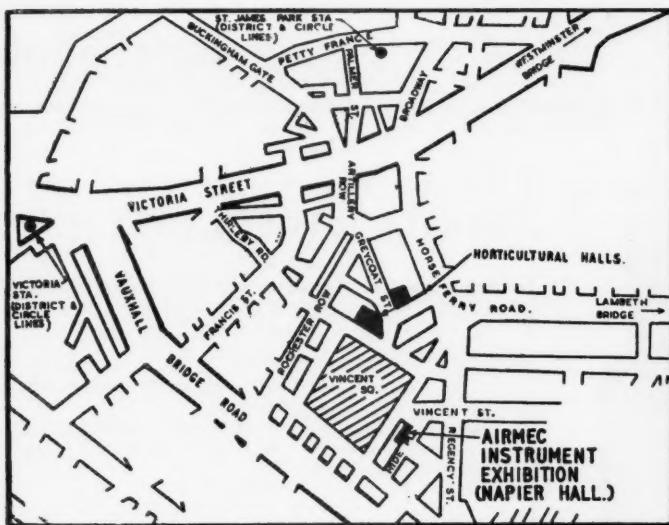
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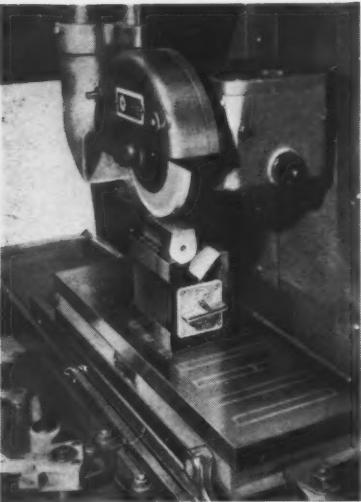
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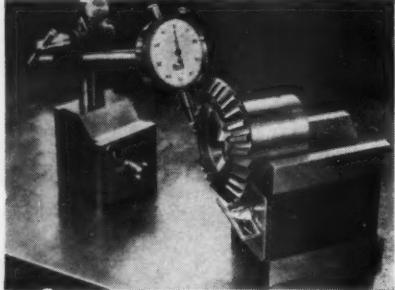
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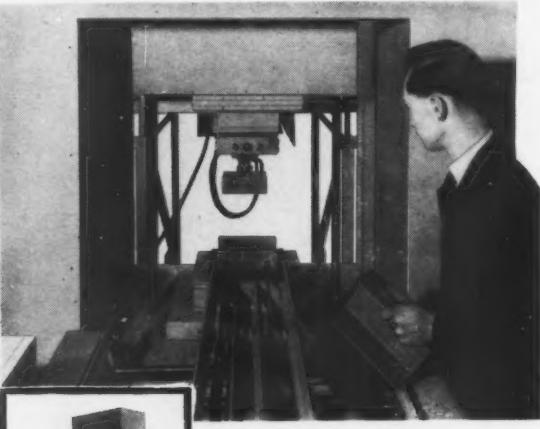


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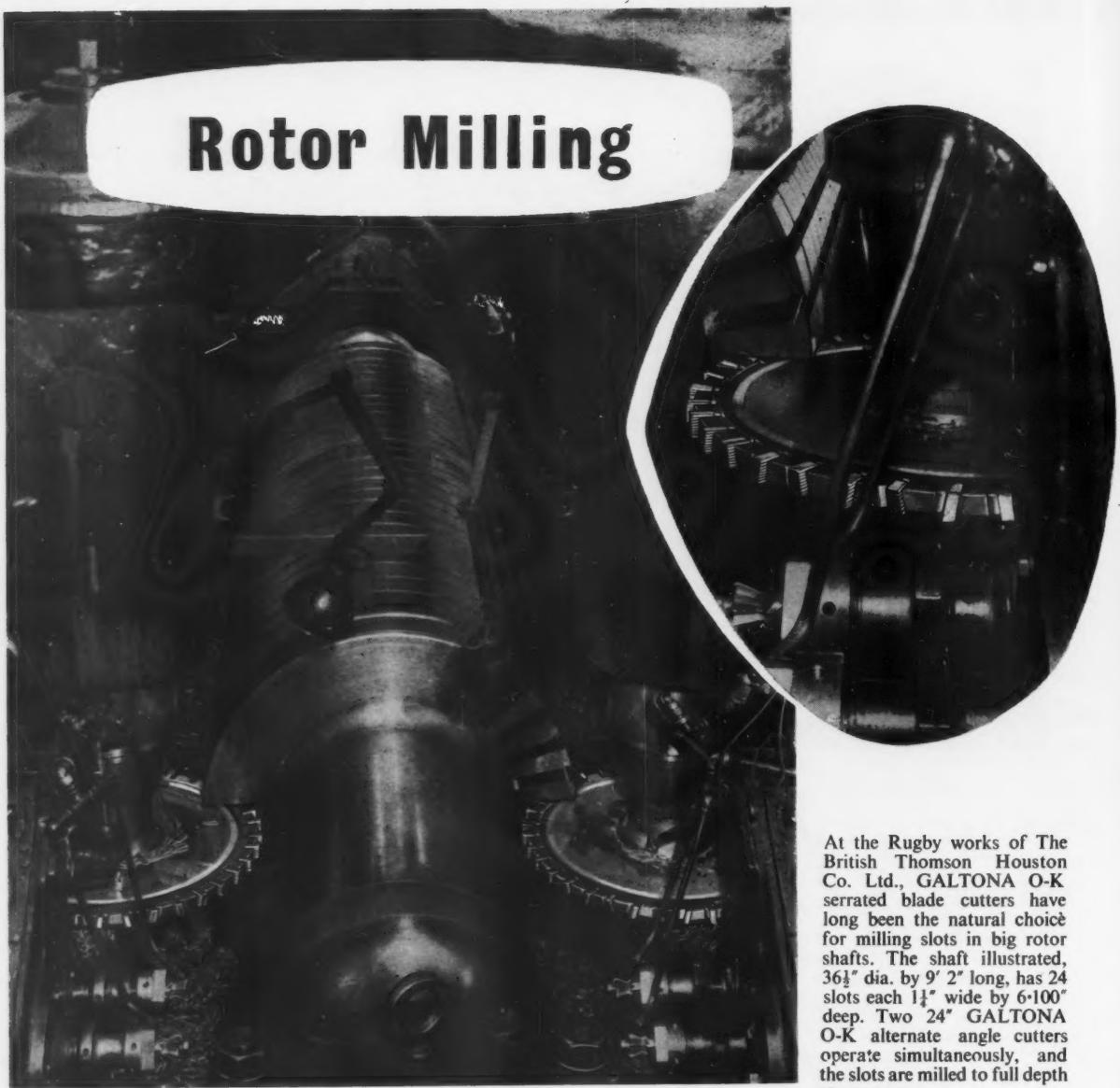
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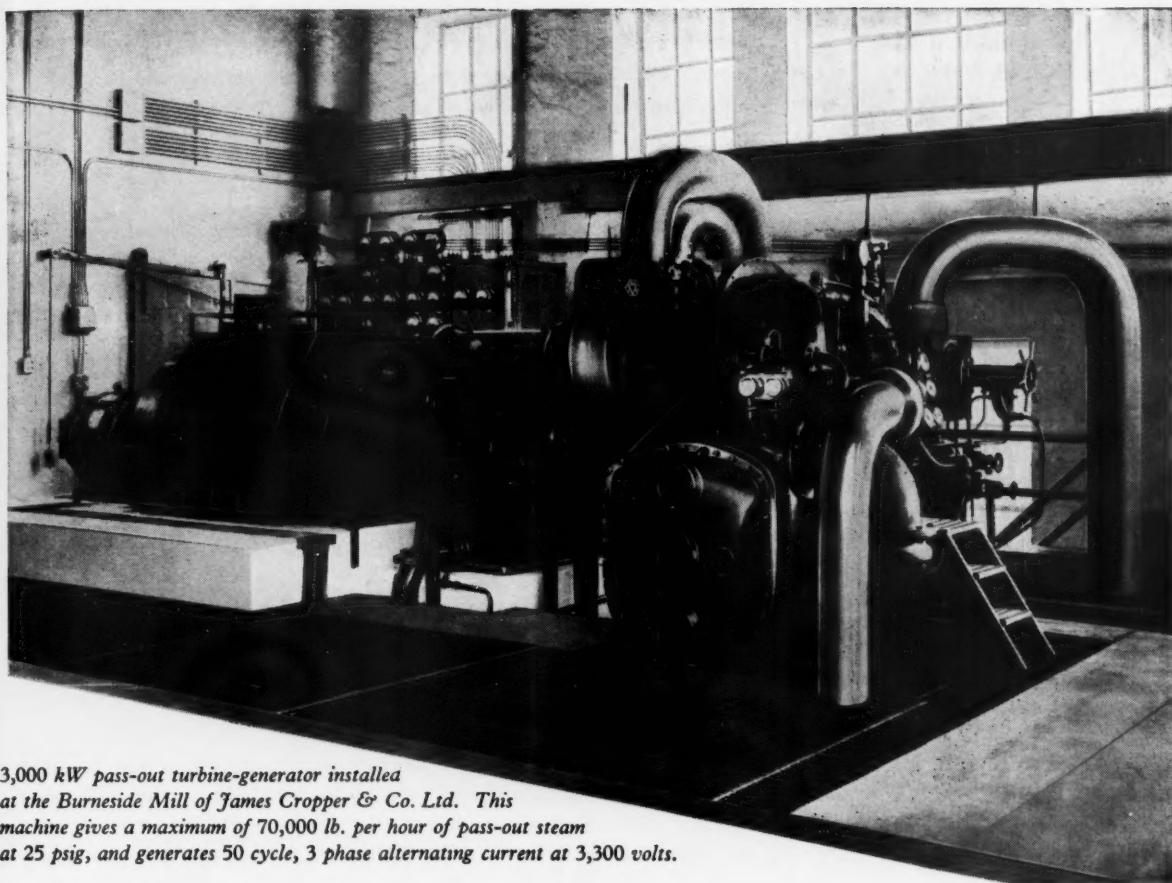


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